The Electrical Industry's Weekly Magazine

September 24, 1956

Electrical World

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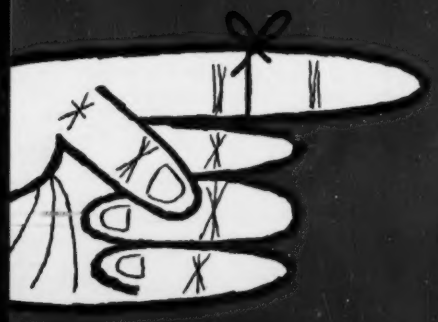

Which Will You Attend?

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MEETINGS CALENDAR

SEPTEMBER

American Institute of Electrical Engineers—Fifth Annual Industrial Electronics Symposium, sponsored jointly with the Institute of Radio Engineers, Hotel Manger, Cleveland, Ohio, Sept. 24-25.

Edison Electric Institute—Meter and Service Committee, Purdue University, Lafayette, Indiana, Sept. 24-26; Farm Group Committees, Belmont Plaza, N. Y., Sept. 27-28; EEI-AGA Taxation Accounting Meeting, William Penn Hotel, Pittsburgh, Pa., Sept. 27-28.

Atomic Industrial Forum, Inc—3rd Annual Forum Conference and 2nd Annual Trade Fair, Morrison Hotel and Navy Pier, Chicago, Ill., Sept. 24-28.

Pennsylvania Electric Association—49th Annual Meeting, Hotel Wm. Penn, Pittsburgh, Pa., Sept. 25-26.

Electric Companies Public Information Program—Steering Committee, Blackstone Hotel, Chicago, Ill., September 26; Workshop Conference, Blackstone Hotel, Chicago, Illinois, September 26-28.

OCTOBER

• **Pennsylvania Electric Association**—System Planning Committee, Skytop Lodge, Skytop, Pa., Oct. 1-2; Electric Equipment Committee, Arlington Hotel, Binghamton, N. Y., Oct. 4-5; Hydraulic Power Committee, Mountain View Hotel, Greensburg, Pa., Oct. 4-5; Systems Operation Committee, Penn Alto Hotel, Altoona, Pa., Oct. 10-11; Meter Committee, Split Rock Lodge, White Haven, Pa., Oct. 18-19; Communications Committee Meeting, Fort Stanwix Hotel, Ro[illegible]

• **American Society of Mec**
ference sponsored jointly w
Engineeers, Chalfonte-Hadc
8-10.

Great Lakes Power Club—
Michigan, Oct. 11-12.

Inter-Industry Farm Electi
Power Use Workshop, M
Wis., Oct. 15-16.

Iowa Utilities Association
Hotel Fort, Des Moines, Iow

• **Michigan Municipal Utili**
Traverse City, Mich., Oct.

American Institute Of Ele
Machine Tools Conference,
Ohio, Oct. 22-24.

American Standards Asso
7th National Conference o
York, Oct. 22-24.

University of Texas—Nint
University Batts Auditoriur

National Safety Council—
Exposition, Chicago, Illinois

National Association Of
Region Meeting, M & M
23-26.

Northwest Public Powe

Power Hits Political Campaigns . . . page 9

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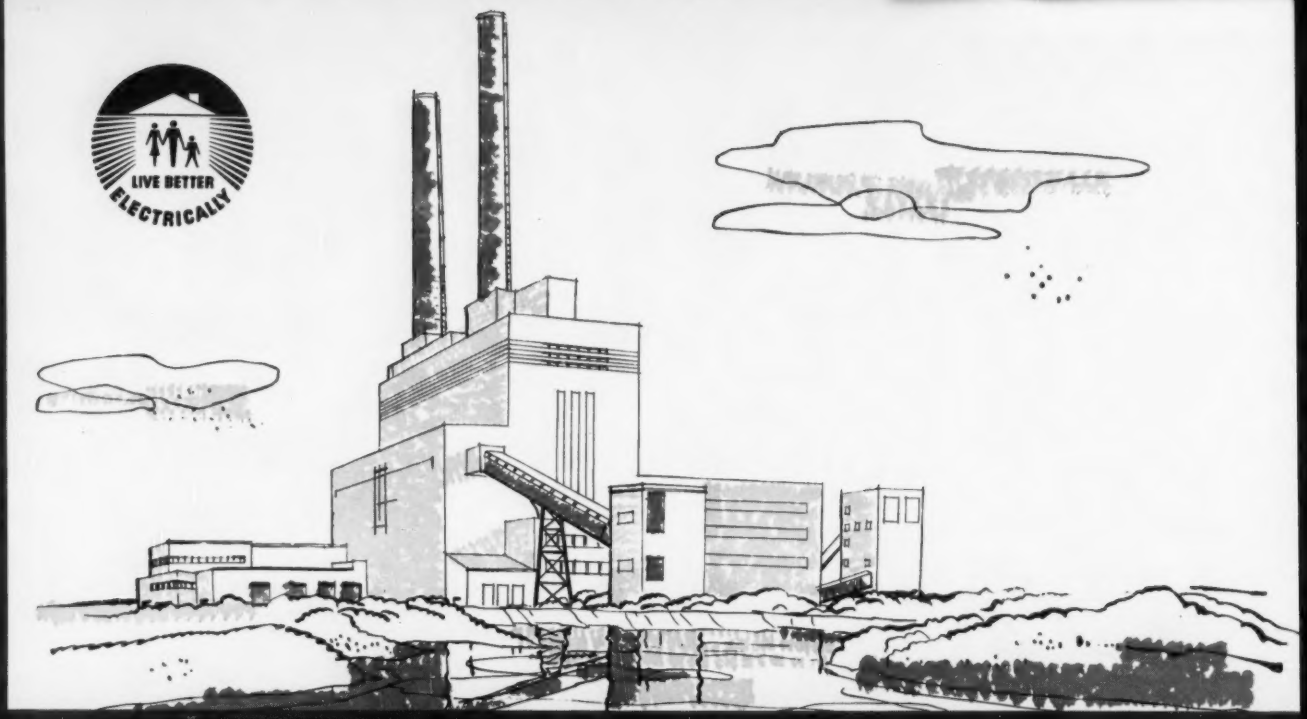


SOARING NUMBER OF STEAM PLANTS BELOW 10,000 BTU/KWHR . . .

Spotlights more efficient operation while expanding to meet growing power demands

▲ **TO MEET SPIRALLING LOAD GROWTH,** electric utility industry must more than double capability in next 8 years. Current trends indicate that this goal must and will be met with more and more efficient generating plants.

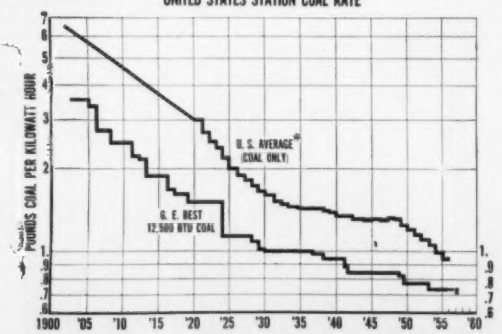
Here's dramatic proof of progress by the electrical industry in boosting system efficiency. According to the report of the Federal Power Commission, a total of 41 steam power plants in the United States passed the traditional yardstick for "top efficiency"—less than 10,000 BTU's per kilowatt hour—during 1955.

This tribute to utilities, consulting engineers, and equipment manufacturers takes on even greater importance in the light of forecasts of over a trillion kilowatt-hour demand by 1965. It demonstrates the tireless efforts being made to improve operating efficiencies of electric utility systems, and keep electricity today's greatest bargain.

35 of 41 General Electric Equipped

Of the 41 "most efficient" steam plants in the U.S., 27 are equipped solely with General Electric turbine-generators, and 8 others have one or more General Electric units. This is another example of the co-operation between utilities and G-E engineers to increase system efficiency and reliability and to help reduce operating expenditures. General Electric's program of expansion of research and production facilities, now in full swing, will provide results to further this trend to greater system efficiency. General Electric Company, Schenectady 5, New York. 301-337

UNITED STATES STATION COAL RATE



STATION COAL RATE chart demonstrates rapid progress in electrical equipment efficiency. *U.S. Average figures are from FPC reports, compared with station coal rates for G.E.'s most efficient machines.

MORE POWER TO AMERICA

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ELECTRICAL WORLD

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Electrical World

Published for 82 years for those engaged in the business of generating, transmitting, distributing, or supplying electric power

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COMING NEXT WEEK—A special report, "Preparing Today for Tomorrow's Personnel Problems," will be a practical textbook for the industrial relations man. It will be authored by 29 members of the EEI Industrial Relations Committee.

Most capacity per pound of weight with the

NEW ALCOA 60-TON COMPRESSOR

• PORTABLE • FAST ACTION

• LARGE RANGE OF CONDUCTOR SIZES

A thrust of 60 tons in a tool weighing only 42 pounds is now possible with the new Alcoa® 60A Compressor. Designed to apply compression fittings on ACSR or stranded aluminum conductors up to two inches in diameter, the new compressor offers more versatility than any other tool available today. Hand- or power-operated pumps are available for the compressor. For more information on the model 60A compressor, contact your Alcoa representative or write ALUMINUM COMPANY OF AMERICA, 2306-W Alcoa Building, Pittsburgh 19, Pa.

THE ALCOA HOUR—Television's Finest Live Drama, Alternate Sunday Evenings

Your Guide to the Best in Aluminum Value

ALCOA ALUMINUM
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ALCOA

HEAD LOCKS in position, can't fall out, unlocks at press of finger. Dies also lock in position, release at push of button. Simplicity with light weight is chief advantage.

PORTABILITY is a main feature. Man on right carries compressor and stand; man in center has gasoline-engine pump, 60 pounds; man on left carries connecting hose and accessories.

FAST ACTING compressor in use on ground. On structures, two men can handle both pump and compressor units. Or, if desired, long pressure hose is available.

EDITORIALS

Which Will You Attend?

This week marks the opening of the fall meeting season. Until late in November meetings of industry groups will average close to six a week. Some will attract several hundred persons, others as few as 30. But big or little all will perform two functions:

- They will provide an opportunity for industry people to get together and talk over mutual problems.
- They will spread the latest information on equipment and industry practices.

For years Electrical World has recognized such meetings as an important factor in disseminating industry information. This fall, as in past years, some 60 pages of the magazine will be filled with these reports.

But such reports are a poor substitute for attending the meetings. Everyone in the industry should plan now to attend all that are in his fields of interest. Even more important, each should strive to participate in discussion, to appear on programs, and to contribute in any way to the best of his ability.

In this issue (page 40) and every issue is the Meetings Calendar to help you schedule the ones which you will attend.

How Much Do People Love Their Trees?

Woodman, spare that tree!
Touch not a single bough!
In youth it sheltered me,
And I'll protect it now.

Probably long before George Pope Morris wrote those immortal lines the first articles on the beauty of trees made their appearance. Since then a considerable amount of "nonsense" on this subject has appeared in print. And one is likely to get the idea that every city dweller whose home is fronted by a tree or two loves them as much as his own children.

Nothing could be further from the truth. The average city dweller has trees in front of his property because someone else planted them and he can't get rid of them except at great expense. In this he differs from the suburbanite who protects his trees because they contribute to his concept of comfort and beauty.

Electric companies might find it far cheaper over a long period to offer to cut down trees for their customers. Some utilities already do this where they can prove that savings in the cost of repeated trimming will justify the higher "one-shot" expenditure. But experience might prove that many customers would be willing to contribute to have their trees removed. And certainly any tree removed would never have to be trimmed.

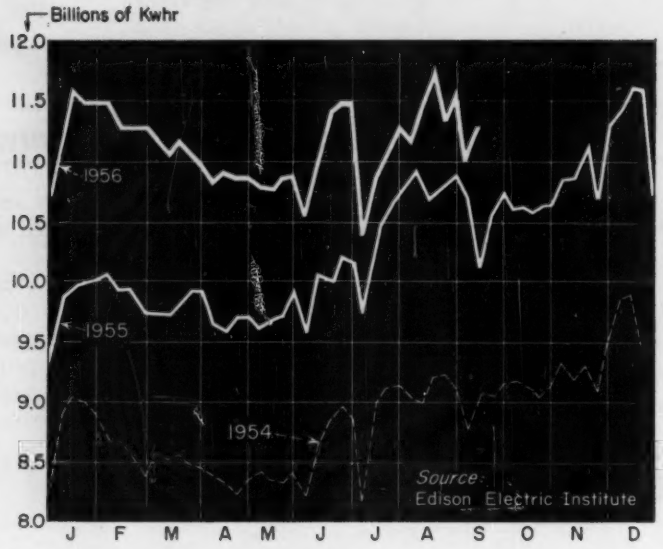
How Do You Like It?

Technical men in the electric utility industry are familiar with the practice of field testing new equipment as a check against the results obtained in the laboratory. This issue of Electrical World might be considered a field test of our typography.

As one of the goals of EW is to improve readability, this issue (with few exceptions) is set in 10 point type on 19 picas (3 1/6 in.). Ordinarily our copy is set in 9 point type on 13 picas (2 1/6 in.).

Do you like the new type better than the old? Are you willing to sacrifice approximately 100 words per page to get more readable type? Your comments will be given serious consideration because this book is being published for you.

ELECTRICAL WEEK



OUTPUT

Week ended Sept. 15
11,339,000,000 Kwhr
Up 6.7%

Atomic Energy Commission requirements—1,125,000,000 kwhr (Electrical World estimate). Excluding AEC, output increase was 5.9%

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Sept. 15	+6.7	+8.9	+6.3	+8.8	+7.2	+5.1	+7.0	+7.4	+3.6	+5.8
Sept. 8	+7.9	+10.7	+9.4	+9.6	+9.7	+5.0	+13.0	+8.8	+4.0	+2.3
Sept. 1	+8.0	+10.8	+8.6	+10.1	+11.0	+5.4	+10.6	+11.3	+3.7	+3.2

Seasonally Adjusted Index 215.8 Week Ago 217.1 Year Ago 201.8

Here are the issue's highlights . . . Even steam plants are hit by big Texas drouth . . . Fall campaign may get power as an issue—whether voters listen or not . . . Federal Power Commission reveals 41 most efficient power plants . . . Con Edison's nuclear plant will use a separate oil-fired superheater and a new source of nuclear fuel—thorium . . . All-in-one billings system saves Kansas Power & Light $7,000 yearly . . . Today's turbine-generator ratings discussed . . . Philip Sporn predicts 2-trillion-kwhr demand by 1975.

Prospects for electric company development at Niagara Falls grow dim. Niagara Mohawk Power Corp, which holds present water-use rights for a share of the power development there, has agreed to trade these to the New York State Power Authority. The trade hinges on the Power Authority's success in obtaining a federal license to develop the entire power potential on the U. S. side of the Falls. That would run around 2.2-million kw . . .

Niagara Mohawk accepted the Power Authority proposal to amend its present application before FPC to include the water-use rights formerly utilized at the company's Schoellkopf Plant. Under the agreement, the utility would receive a contract for 445,000 kw for a 40-year period. This capacity would come from the Power Authority's proposed plant downstream. Schoellkopf Plant had a capacity of around 335,000 kw, but the additional head of the downstream plant will make extra capacity available . . .

The agreement does not specifically prohibit Niagara Mohawk and the four other leading New York electric companies from carrying on a battle in Congress for approval of electric company development. But Niagara Mohawk will not contest the Power Authority application before FPC on constitutional grounds. It is intervening in the case only to protect its present water-use rights at Niagara Falls.

NEWS OF THE INDUSTRY BRIEFLY TOLD

Washington Wire . . . Atomic Energy Commission must act now on the petition by three labor unions asking AEC to hold hearings on so-called hazards of the nuclear power plant being built outside Detroit by Power Reactor Development Corp. AEC has received a reply from PRDC saying the hearings would delay the group's program and would have no "conceivable effect upon the health or safety of the public." Fissionable materials cannot be used at the reactor site until AEC issues an operating license—about the end of 1959 . . . Meanwhile, Sen Pat McNamara (D-Mich.), in a letter to PRDC's Pres Walker L. Cisler, charges that the company is raising a "smokescreen of fictional partisan politics" to block "legitimate questions" about the reactor.

Yankee Atomic Electric awards to Westinghouse Electric a contract to design and develop the nuclear reactor for its 134,000-kw, $35-million atomic power plant. Reactor will be of the pressurized-water type with stainless steel clad fuel elements using slightly enriched uranium oxide.

General Electric hikes prices of all capacitor lines about 7½% to cover recent increases in cost of steel, aluminum, other raw materials, and labor.

A continuous two-way system of communications among company employees is perhaps the most basic and necessary element in keeping a sound economic structure, declares Donald S. Kennedy at round table conference of EEI's Industrial Relations Committee.

Entries in the national Housepower Contest are nudging the 250,000 mark as the $100,000 competition enters its last week, according to EEI.

Public Service Co of Indiana asks Securities and Exchange Commission to investigate American G&E for possible violation of Public Utility Holding Co Act. At issue is the proposed Indiana & Michigan Electric plant which will house a 450,000-kw generator. Public Service contends that 330-kv power lines from the plant would cross existing Public Service lines and thereby violate the act. Philip Sporn, president of AG&E, says that Public Service's petition is based on a "complete misinterpretation" of AG&E's program.

ABOUT PEOPLE IN THE INDUSTRY

James F. Fairman, vice president of Consolidated Edison, **is nominated as chairman** of Edison Electric Institute's newly formed Technical Appraisal Task Force on Atomic Power Reactors. The group will review reactors and recommend those having promise of feasibility for production of electric power. As Electrical World went to press, Fairman's election by EEI's board of directors seemed assured.

Westinghouse Electric is now spending "in excess of $150 million a year on research, development, and engineering," declares **Mark W. Cresap,** executive vice president. These expenses have more than doubled in the past five years and are about 10% of the company's gross income, Cresap says. As part of its expanded research program, Westinghouse dedicated its new Research Laboratories near Pittsburgh last week.

More News About People page 36

Trouble in Texas:

Big Drouth

Texas Hydro-Electric has its back to the wall, but new state water policy may help it and other hard-hit utilities

About three-fourths of Texas is caught in the grip of what some scientists are calling a "permanent drouth." If rain continues to avoid all but East Texas, the Texas Hydro-Electric Corp's dams, which cost millions, won't be worth a postage stamp, a company official predicted glumly.

The 1956 drouth may prove a turning point in state water policy, for even underground water sources are being taxed in some areas. This poses new problems for power companies that recently have been forced to drill wells to obtain cooling water for steam plants.

As a case in point, Comal Springs, headwater of the Guadalupe River (see cut), flowed 200 million gallons daily. At mid-summer, the springs went dry. Downstream, 11 power plants were crippled. No steam plant had storage for condensing water. Hydro potential was lost too. Now the Lower Colorado River Authority is building cooling towers to conserve condensing water in the future for its steam plants.

Water Policy to Be Formed

The hot, dry weather since 1949 has focused attention on the acute water problem. Texas' Water Resources Committee, set up by the legislature, is studying proposals for a state water policy. This may encompass making better use of streams and lakes, state financing of dams, and experimental cloud-seeding to increase rainfall.

"Drouth is a permanent thing for a good part of Texas" under present prospects, Archie M. Kahn, executive director for Texas A&M College Research Foundation, told the committee at a hearing.

He explained that industry, agriculture, and cities are increasing demands rapidly. The underground supply is being drained away. Although some dams have been built, construction has not paced the increasing demands for water. The situation is growing worse.

Trigg Twichell, district engineer, U.S. Geological Survey, predicted that Comal Springs in the future "will just be a wet-weather spring." This water source is tapped by the City of San Antonio, military posts, farmers, and others. Comal Springs dried up, Twichell said, from a combination of drouth and increased withdrawal of water from wells in the area.

The USGS engineer said that the proposed Canyon Dam on the Guadalupe River would provide water for downstream electric plants. But the project is now in dispute, and construction is blocked.

The drouth has hit hydroelectric power production in Texas at places other than the Guadalupe River. Falcon reservoir on the lower Rio Grande has been greatly reduced, although recent rains brought some relief. Power generation has suffered both on the Rio Grande at Eagle Pass and at two plants on Devil's River, a tributary.

The prevailing drouth condition points up two things to state officials: More water storage capacity is needed, and more rain must fall. The officials are planning to act soon on both.

The Texas Water Resources Committee now is studying possibility of state aid for conservation storage in federally built dams. Dam sites now are being claimed rapidly, and multi-purpose dams are desired. An estimated $40 million to $50 million would be required for the state to add the needed conservation storage in federal dams to be built for flood control. The committee also is preparing a proposed constitutional amendment which would enable a $100-million bond issue to be put forth to help finance Texas dams.

Rain-Making Experiments Urged

Cloud seeding may enable drouth-stricken Texans to increase rainfall. Meteorologists admit cloud seeding is an inexact science, but say the indications are good enough to encourage spending more money on experiments.

(Irving P. Krick, Inc, of Denver already is seeding clouds in the Dallas-Fort Worth area under contract with those cities.)

State Sen George Parkhouse of Dallas, chairman of the water resources committee, said he sees no reason why the legislature should not be asked to appropriate $100,000 to $200,000 yearly for cloud-seeding research and experimentation.

"If it is found to be practical, our money would be returned a thousandfold in a short time," Parkhouse said. "If the experiment failed, we would not have lost much."

Republicans Are Preparing . . .

For Democrats' Attack, When . . .

'Power' Hits the Campaign Trail

Candidates seem set to manufacture a power issue whether voters listen or not

Electric power development promises to be one of the liveliest "talking" issues in this fall's election campaigns.

Candidates will devote a great deal of attention to power development—federal, partnership, and free enterprise—in scores of talks in many parts of the nation. But there is considerable doubt whether the issue has any real sex appeal to the voters.

Among the national candidates, the Democrat's vice presidential candidate, Estes Kefauver, is already plugging hard at the power issue.

His Republican counterpart, Richard M. Nixon, will be checking "trouble spots" throughout the country on his present air swing. He's already spotted some in Washington and Oregon where the electric power development comes close to being a "bread-and-butter" proposition.

Democratic Presidential Candidate Adlai Stevenson thus far is stepping lightly on the power issue as he did in the 1952 campaign. But close observers wouldn't be surprised if he leans more heavily to federal development in his Pacific Northwest speeches.

But even though power development is of tremendous importance in the Northwest, there's no sure sign that voters there consider it a red-hot political issue.

A recently released study of voter thinking in Oregon, where former Interior Secretary Douglas McKay is battling Democrat Wayne Morse, indicates little real concern over power as a political issue.

As the campaigns got underway in earnest last week, there were these developments:

• Well-placed Republican campaign strategists were privately quite dubious about another win in Tennessee, which went for Eisenhower in 1952. Part of their pessimism stems from the fact that Tennessee is the home state of Kefauver. But they also believe that the Democrats have turned the Dixon-Yates episode into a potent political weapon.

• In the Washington State primary elections, Democrat Warren G. Magnuson, a federal power advocate, ran about eight-to-five ahead of Republican Arthur Langlie, who supports the Republican partnership philosophy, in the Senatorial race. Politically this wasn't much more than a popularity contest, since neither Magnuson nor Langlie had primary opposition. But Langlie is worried.

• In the nation's capital, there's betting that President Eisenhower will venture into the Northwest for a major address defending his power program.

But the most active Republican spokesman on power matters is sure to be new Interior Secretary Fred A. Seaton. Seaton is already telling interviewers that federal spending for power development will increase over the next few years. He points to the Upper Colorado and the Trinity River projects as ripe for federal outlays. The Interior Chief promises an all-out fight for the Fryingpan-Arkansas project next year.

Seaton seems to view his job as one that involves the responsibility to have power available where it's needed in the future. For instance, he even purports to foresee a time when the federal government will have to build steam plants, a practice now confined to the Tennessee Valley.

This kind of thinking, in some respects, goes even beyond the expressed philosophy of top Democratic candidates. It is considerably beyond the power policies previously written by the Eisenhower Administration.

Most Efficient Plants Revealed by FPC

Commission's latest survey discloses 41 plants operated under 10,000 Btu in 1955, an increase of 12 over previous year

The trend toward greater efficiency in electric power plant operation is reflected in a recent Federal Power Commission survey which reveals that last year 41 power plants operated at annual average heat rates of under 10,000 Btu per kwhr.

The FPC eighth annual supplement to "Steam-Electric Plant Construction Cost and Annual Production Expenses 1938-1947" for 1955 noted that this increase contrasts with the 29 plants in this category in 1954.

Only two plants operated under 10,000 Btu in 1950. One of these, the Schiller plant, is still among the first twenty.

In addition to these 41 plants, there are several new units in older stations with heat rates below 10,000 Btu, although overall plant rates exceed this figure, said the FPC report.

The study, which covers 459 plants, notes that all 41 plants operate on conventional reheat steam cycles with the exception of the Schiller plant. Of the 12 plants under 9,500 Btu, only one—El Segundo—is not coal-fired. It uses oil and natural gas.

Three newcomers in the first ten bracket since 1954 are Kyger Creek, Clifty Creek, and Albany.

The survey also noted:

- Fuel costs range generally from 60-80% of total production costs. Coal accounted for 68% of total fuel requirements, natural gas 23%, and oil 9% in 1955.
- As the price of natural gas continues to increase more reheat units are being ordered in areas where natural gas is the main fuel.
- The reheat unit is becoming more and more common for all fuels in plants of 50 Mw and larger.

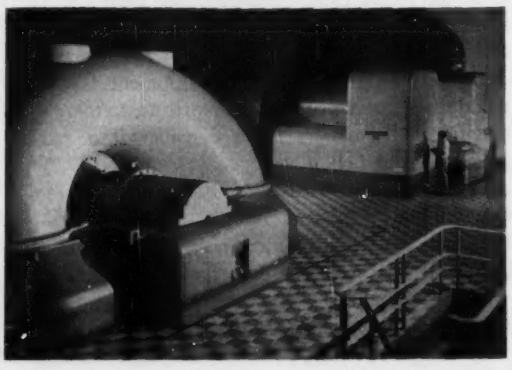
1955 Heat Rates Reported By FPC

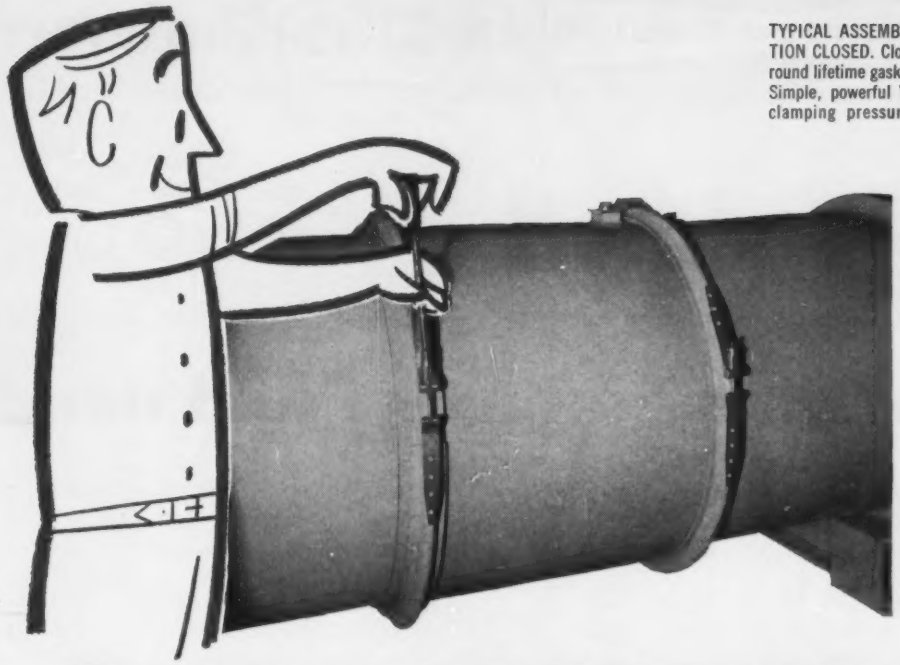
	Btu/kwhr
1. Kyger Creek (Ohio Valley Electric Corp)	9,110
2. Clifty Creek (Indiana-Kentucky Electric Corp)	9,143
3. Kanawha River (Appalachian Electric Power)	9,151
4. St. Clair (Detroit Edison Co)	9,220
5. Muskingum River (Ohio Power Co)	9,234
6. Tanners Creek (Indiana & Michigan Electric Co)	9,273
7. Eastlake (Cleveland Electric Illuminating Co)	9,336
8. Philip Sporn (Ohio Power Co)	9,341
9. Shawville (Pennsylvania Electric Co)	9,368
10. Albany (Niagara Mohawk Power Corp)	9,373
11. El Segundo (Southern California Edison Co)	9,417
12. Oak Creek (Wisconsin Electric Power Co)	9,480
13. Kearney "B" (Public Service Electric & Gas Co)	9,511
14. Dunkirk (Niagara Mohawk Power Corp)	9,523
15. Cromby (Philadelphia Electric Co)	9,540
16. Barry (Alabama Power Co)	9,551
17. Whiting (Consumers Power Co)	9,560
18. Milliken (New York State Electric & Gas)	9,567
19. Schiller (Public Service Co of New Hampshire)	9,576
20. Niles (Ohio Edison Co)	9,627
21. Kingston (Tennessee Valley Authority)	9,638
22. Beckjord (Cincinnati Gas & Electric Co)	9,716
23. Shawnee (TVA)	9,721
24. Etiwanda (Southern California Edison Co)	9,741
25. Wood River (Illinois Power Co)	9,762
26. Bay Shore (Toledo Edison Co)	9,766
27. Colbert (TVA)	9,819
28. Widows Creek (TVA)	9,821
29. Astoria (Consolidated Edison Co of New York)	9,841
30. Joppa (Electric Energy, Inc)	9,842
31. Glendwood No. 3 (Long Island Lighting Co)	9,844
32. Morro Bay (Pacific Gas & Electric Co	9,845
33. Will County (Commonwealth Edison Co)	9,871
34. Danskammer (Central Hudson Gas & Electric Corp)	9,873
35. Titus (Metropolitan Edison Co)	9,881
36. Portsmouth (Virginia Electric & Power Co)	9,913
37. Twin Branch (Indiana & Michigan Electric Co)	9,940
38. Urquhart (South Carolina Generating Co)	9,945
39. Far Rockaway (Long Island Lighting Co)	9,957
40. Rock River (Wisconsin Power & Light Co)	9,961
41. Salem Harbor (New England Power Co)	9,995

Kyger Creek Symbolizes Power Plant Efficiency Trend

Ohio Valley Electric Corp's Kyger Creek station, most efficient in the nation according to FPC's 1955 heat rate report, employs four 217,260-kw turbine generators designed for steam conditions of 2,000 psig, and 1050F initial and reheat temperature.

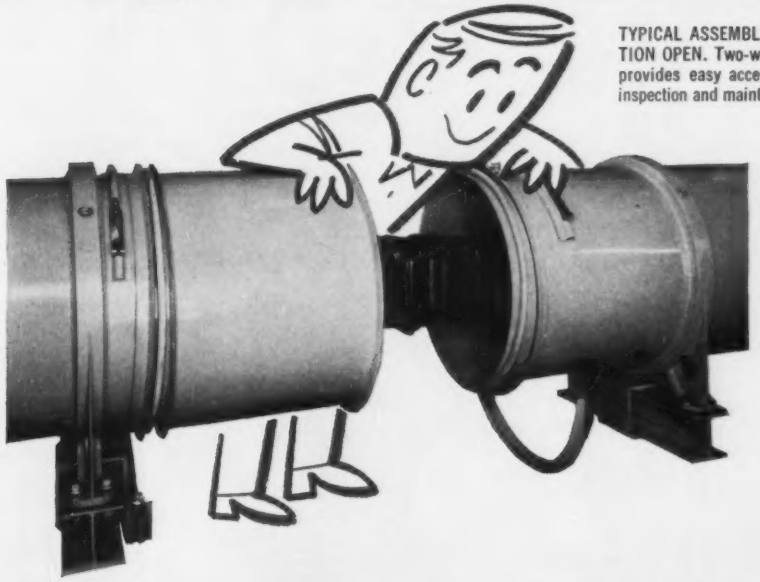
Each high pressure turbine element, built by Westinghouse Electric Corp, consists of a high-pressure and intermediate elements connected in tandem that drives a 130,000-kw, 3600-rpm, 85% power factor hydrogen-cooled generator. The low-pressure double-flow turbine element drives an 87,-260-kw, 1800-rpm, 85% power factor, hydrogen-cooled generator.





TYPICAL ASSEMBLY WITH TELESCOPING SECTION CLOSED. Closure requires only two 1-piece round lifetime gaskets—easy to place and remove. Simple, powerful V-clamp couplings distribute clamping pressure uniformly around the ring.

New design of I-T-E Isolated Phase Bus



TYPICAL ASSEMBLY WITH TELESCOPING SECTION OPEN. Two-way sliding telescoping section provides easy access to connectors—simplifies inspection and maintenance.

simplifies installation and inspection

All-welded aluminum basic assemblies—joined together with 2-way sliding telescoping sections—cut installation and inspection time. A V-clamp closure and a 1-piece round gasket in each telescoping section joint assure a permanently tight seal. This new design reduces gasketing 75%. In addition, it combines great strength and light weight with structural simplicity. And smooth inside surfaces prevent the accumulation of moisture.

Bulletins 10004-A and 10004-B describe I-T-E Isolated Phase Bus designs. For copies of these bulletins, write I-T-E Circuit Breaker Company, 19th and Hamilton Sts., Phila. 30, Pa.

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Engineered
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In the *balanced design* of Allis-Chalmers power transformers, each feature complements the others to provide outstanding dependability and long transformer life.

High Impulse Strength — Coil assemblies are designed to withstand repeated lightning and switching voltage surges without damage to the transformer.

Corona-Free Design — Keeps transformers young. Full insulation strength is maintained because transformer parts are kept free of corona's injurious effects.

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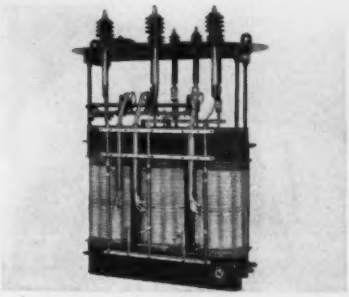
Reduced Size and Weight — Substantial reductions in height and weight simplify installation and relocation. Larger units can be shipped completely assembled.

High Short-Circuit Strength — In Allis-Chalmers transformers, circular coils are preshrunk and rigidly braced to withstand short-circuit conditions. Careful electrical balance of windings minimizes mechanical forces.

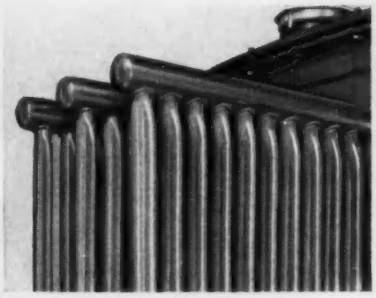
Get the complete "balanced design" story from your Allis-Chalmers representative. With a vast background of application engineering experience at his disposal, he will be glad to discuss transformer problems with you. Call your nearby Allis-Chalmers office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Mechanical Strength...

One of the Many "Engineered-Together" Features of A-C Small and Medium Power Transformers



Side frame design locks core and coil assembly firmly to protect against short-circuit forces. Machine-wound insulating tubes provide rigid support for leads.



Radiator assembly is welded into tank wall to provide neat appearance and strong construction. Gasket maintenance is eliminated.

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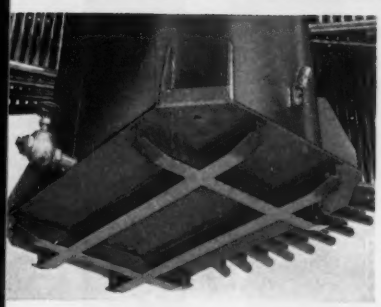
Power Transformers

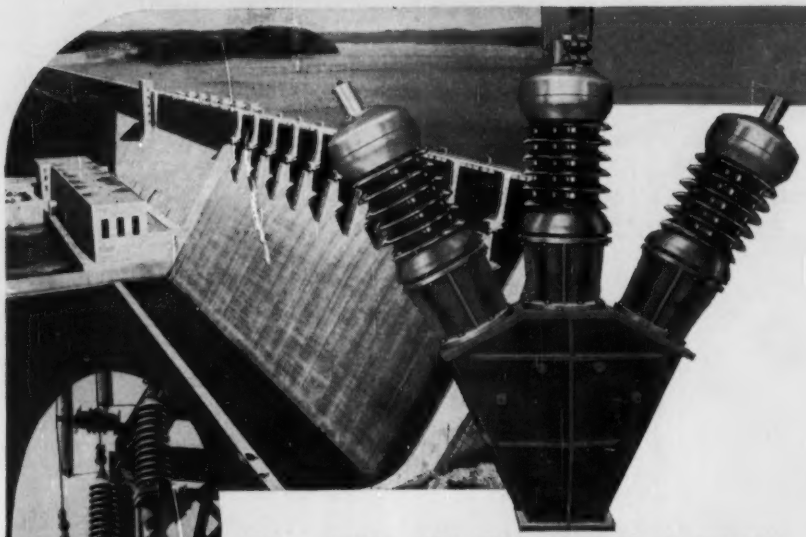


New base combines strength with utility. Heavy I-beam supports are turned upward at ends to allow sliding or rolling of transformer in any direction.

CHALMERS

A-C
ALLIS-CHALMERS

A-5149

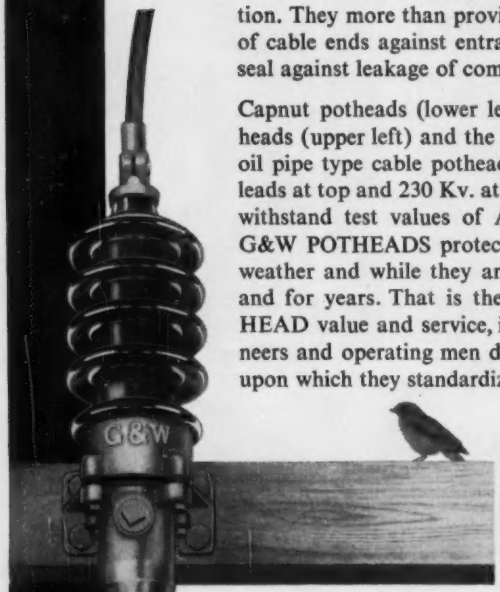


G&W POTHEADS

WEBSTER—*Pothead (pot-hed) n. Elec.—a form of terminal hermetically sealed to the sheath of an electric cable for making a moisture-proof connection between the wires within the cable and those outside.*

G&W POTHEADS more than meet Webster's definition. They more than provide positive hermetic sealing of cable ends against entrance of moisture. They also seal against leakage of compound and cable oil.

Capnut potheads (lower left), soldered porcelain potheads (upper left) and the 200 pounds per square inch oil pipe type cable potheads (26 Kv. 3 pole generator leads at top and 230 Kv. at right) fully meet the voltage withstand test values of A.I.E.E. Standards No. 48. G&W POTHEADS protect cable ends not just in fair weather and while they are new—but in all weathers and for years. That is the definition of G&W POTHEAD value and service, it is also why so many engineers and operating men define G&W as the potheads upon which they standardize.



Send for publications on potheads—

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Bul. AB51—"Capnut"
Bul. AB-D—"Instal. Instr."
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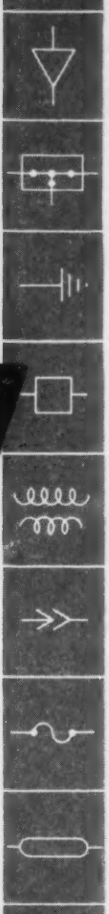


G&W CABLE TERMINATING, CONNECTING, FUSING, SWITCHING DEVICES

Forecast for 2010 AD . . .

Pacific Northwest water resources experts are now estimating the amount of water which will flow in Columbia Basin streams in the year 2010. The group seeks to prove that upstream irrigation rights will not reduce the power potential of downstream federal dams. The upstream irrigation rights form one provision in the Columbia Basin Compact which already has been approved by federal agencies.

The revised draft of the Compact now must be ratified by Idaho, Nevada, and Utah, all of which approved the original, as well as by Washington, Oregon, Montana, and Wyoming, which did not approved the original. The compact also has been amended to prevent the five upstream states from outvoting Washington and Oregon downstream in matters relating to use of the Columbia Basin's water resources.

Pipe Dreams, Past & Present

Pittsburgh Consolidation Coal Co, which now is pressure testing its coal pipeline between its Cadiz, Ohio, mine and Cleveland Electric Illuminating's steam plant at Eastlake, Ohio, has given some indication that it is dreaming of perhaps building similar lines in the future. The line now being finished was conceived as a means of cutting freight costs, which may represent 50% of the coal's cost to the utility for hauls over 100 miles.

This perhaps may give substance to the dream of a visionary chap named Andrews who, in 1891, won a patent for transporting a solid-liquid mixture through pipes. Andrews took a model of his invention to the 1893 Columbian World Fair in Chicago and won an award. The judges stated: "This method is destined ere long to become the carbon thoroughfare for the transportation of the motive power of the ages."

Atoms in the South

Organization of a large-scale nuclear energy program in the South took another step forward recently when 16 state governors from the area unanimously endorsed in principle the recommendations made in August by the Work Conference on Nuclear Energy (EW, Aug. 20, p 100).

Discussion at the conference stressed:

- The importance of atomic energy to the economic development of the South and the necessity of state and regional action.
- The need to increase educational programs in the area to help solve the current and projected technical and scientific manpower shortage.
- The necessity of developing specialized nuclear facilities for training and industrial research, including a major nuclear center with a high flux test reactor.
- The importance of establishing immediately a regional nuclear advisory council for the 16 states.

Spite: Lines & Obstructions

The "spite line" controversy between Southwestern Gas and Electric Co and an Arkansas REA (EW, Sept. 10, p 10) is ended. SG&E traded customers in rural areas of Northwest Arkansas for 77 customers of Ozarks Rural Electric Cooperative Corp living in areas recently annexed to Springdale and Fayetville, Ark.

Trouble arose when the annexation was made last fall. Under a 1955 state law, SG&E was to take over the co-op's customers annexed to those cities, but was directed to buy the co-op's facilities or swap some of its rural customers. No agreement could be reached. The co-op accused SG&E of building "spite lines" into the area, and SG&E accused the co-op of erecting "spite obstructions." The controversy was settled after a state PSC hearing.

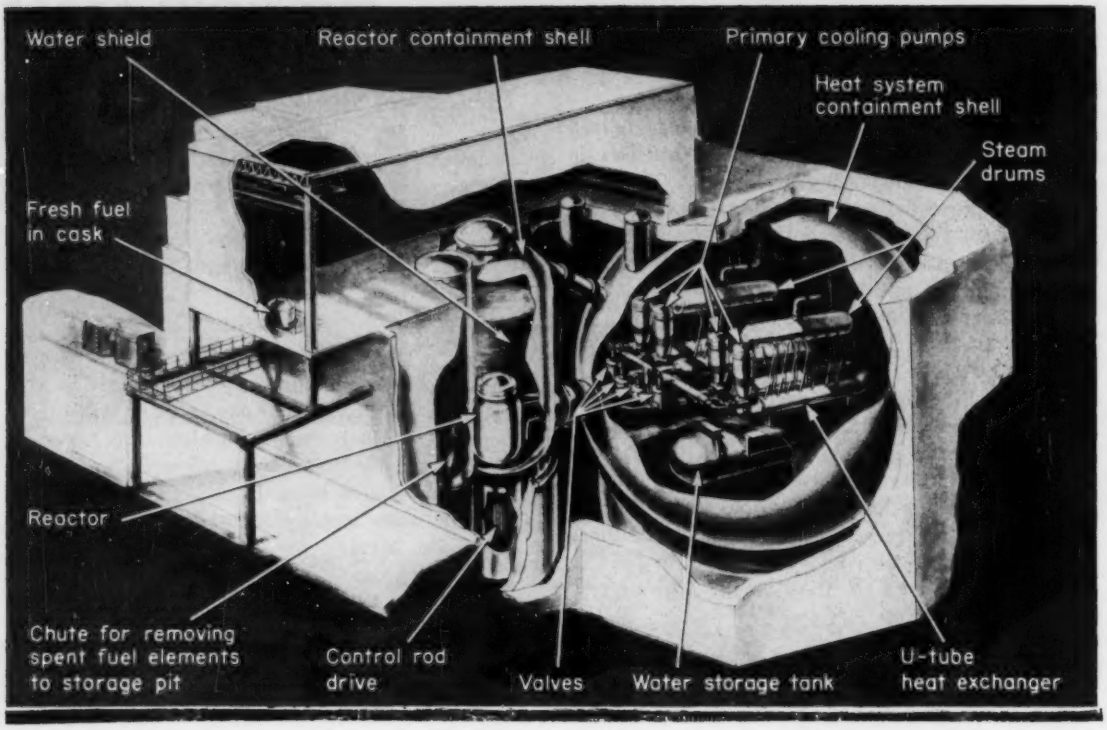
Nicholas J. Conrad Dies

Nicholas J. Conrad, 73, co-founder in 1910 of Schweitzer & Conrad, Inc, died last week after an illness of 18 months. Conrad, who was secretary, treasurer, and general manager of the firm from 1910 to 1930, was named president in 1945 when he reacquired the company after 15 years of operation by Cutler-Hammer, Inc. He has been board chairman and director of the renamed S&C Electric Co since 1952.

Troubles, Troubles . . .

Mars was supposed to turn on the lights at the Kentucky State Fair this month. An 8-in. telescope was all set and aimed. The black cover shading the lens was in place. The electric eye and an amplifier were ready. But just when needed, the amplifier went dead. A fuse had blown. A mere mortal quietly pushed a button and lights blazed on, impressing visitors as planned.

Half of New York State Fair was plunged into darkness this month when an antique high-voltage oil switch burned out. Before repairs could be made, another switch let go. "There is no question but that the electrical system is very old," observed the fair's director.



Con Ed's Reactor Shows Promise

GENERATION
Design

Construction begins on nuclear plant that will strive for flexibility of operation with use of separately oil-fired superheater and a new source of nuclear fuel—thorium

The Indian Point nuclear power plant of Consolidated Edison Co of New York has entered the early construction phase. Orders have been placed for most major equipment. And the seismological, hydrological, and geological surveys have been completed. A meteorological survey is now being conducted at the plant site by New York University. Plant will be rated 236 Mw and will use a pressurized water internal thorium converter reactor (EW, April 4, 1955, p 58).

This is believed to be the only reactor designed or even proposed which incorporates internal conversion of thorium. Advantages of this new fuel arrangement compared with non-converting uranium cores for a large-scale plant include:

1. Increased flexibility of operation.
2. Potentially lower fuel costs.
3. Greater burnout of the basic fuel and fewer fuel changes.
4. Utilization of a new raw material (thorium) which may be more plentiful than uranium.

Maximum design rating of the reactor is 500 Mw of heat. It produces saturated steam at 420 psia. This steam however is raised to a temperature of 1,000F in a separately oil-fired superheater. The turbine will have a nameplate rating of 250 Mw and run at 1,800 rpm with rated throttle conditions of 1,000F and 335 psig.

Details of the reactor and economics of power generation presented in this article are based on a World Power Conference paper on the Indian Point Plant presented at Vienna, Austria, last June by G. R. Milne, Consolidated Edison Co of N. Y., and W. T. Moore, Babcock & Wilcox Co.

Reactor is an internal thorium thermal converter. It is fueled initially with highly enriched U-235 and is moderated and cooled with pressurized light water. The active portion of the reactor, the core, is a right cylinder about 6 ft in height and about 6 ft in mean diameter. The core is made up of over one hundred replaceable fuel elements each of which is square in cross section and contains alternate fuel

and fertile thorium plates separated by coolant channels.

Thorium was chosen as the fertile material on the basis of its structural properties, its compatibility with Zircaloy (used as the cladding material), its low irradiation damage, and its superior ability to supplement the original fuel supply.

The core is surrounded laterally by a 6-in. water reflector, and the entire assembly is housed in a thick-walled pressure vessel. Steel thermal shields protect the pressure vessel against structural damage and excessive heating from neutron and gamma flux. A portion of the main coolant flow is diverted to cool the thermal shields and pressure vessel.

The composition of the core is determined by the requirements of heat transfer, structural integrity, excess reactivity, and the need for an adequate negative temperature coefficient. With about 55% of the core volume filled with water and an inventory of about 8,275 kg of thorium, approximately 275 kg of fully-enriched U-235 provide sufficient excess fuel to accommodate the various reactivity changes.

Under normal conditions, 120,000 gpm of coolant water are passed through the fuel element coolant channels, but significant diversions are made for the control rods, the reflector, and, as previously noted, the thermal shields. Flow is upward and single-pass from four inlet connections in the lower section of the pressure vessel to four outlet connections in the upper section of the vessel. Pressure is maintained at 1,500 psia. This pressure is great enough to prevent boiling in the core. The coolant temperature is limited by a maximum fuel plate surface temperature of 600F. Mean reactor water outlet temperature is 510F, and mean reactor water inlet temperature is 480F.

The average heat flux for full power operation of a new core is about 169,000 Btu per hr-ft^2. This is reduced somewhat because the production of heat is spread to the thorium plates and no more than one-third of the core will be replaced at any time. Thus the average heat flux will probably never exceed the initial value.

For proper operation of this reactor, an excess of reactivity over the cold, clean core is required in order to compensate the effects of:

1. Increase in moderator (water) temperature.
2. Buildup of fission product poisons.
3. Burnout of fuel and buildup of higher isotopes.
4. Short-time-shutdown buildup of Xe-135.

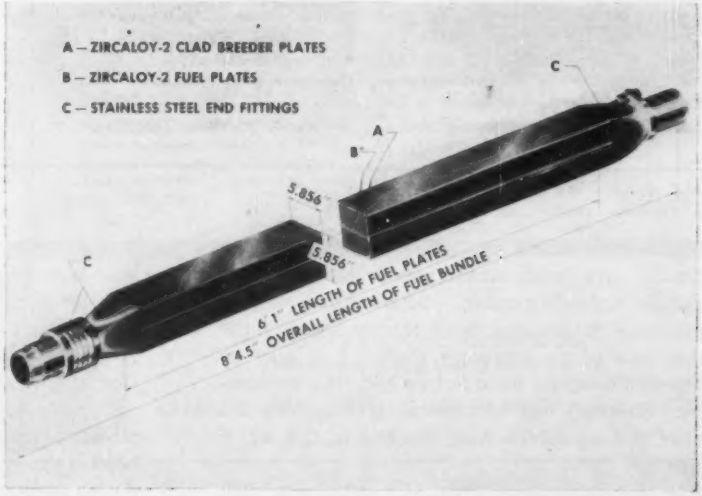
This excess reactivity is balanced out as required by 21 individually driven, cross-shaped boron steel control rods.

The proposed control rod pattern is a central regulating rod surrounded by 20 shim rods in two concentric rings. The size and location of the rods will be such as to provide the required excess reactivity plus about 5% extra shutdown delta k below the cold, clean condition to provide for suitable sensitivity to regulating rod movement and to obtain some degree of flux uniformity. Rod removal rates will be limited to insure a safe maximum rate of reactivity change. An additional safeguard is provided by the negative temperature coefficient of 1.6 x 10^{-4} delta k per degree F at operating temperature.

Fuel Element Sub Assembly

The fuel elements are assemblies of 0.060 in. thick fuel plates and 0.080 in. thick fertile plates spaced alternately to provide 0.010 in. water channels. Individual plates are about 2½ in. wide and are assembled in two rows in order to provide a square cross section with a lateral dimension somewhat more than two plate widths. All assemblies are of identical dimensions.

The assemblies are provided with suitable top and bottom transition pieces to permit good flow distribution and to facilitate firm positioning and support in the upper and lower grids. The upper grid functions as a holddown device to resist the hydraulic lifting forces on the assemblies. The lower transition piece of each assembly contains a spring mechanism to accommodate differential expansion between the elements and the core supporting structure.



Economics of Electric Power Generation at Indian Point

Because present temperature limitations of reactors result in saturated steam of relatively low pressure and therefor temperature as compared to modern steam plants, the economics of superheating the steam generated by the reactor before using it in the turbo-generator were investigated. The cost, capacity, and plant heat rate, exclusive of reactor thermal efficiency, were calculated for a plant using the saturated steam produced by the reactor to run the turbine and for an alternate plant in which the saturated steam from the reactor would be superheated in a separate oil-fired superheater.

The results of the study on superheating are shown in the table above. While the economics of superheating the saturated steam from the reactor at a pressure of 405 psig and a temperature of 446F at the turbine throttle to various temperatures, 860F, 1,000F, and 1,050F, were studied, only the most economic case is shown, namely that for 1,000F. Steam pressure at the throttle is reduced from 405 psig to about 355 psig because of pressure drop in superheater and piping. Addition of superheat to cycle results in an increase in capacity from 140,000 kw to 236,000 kw and a reduction in cost from $322 per kw for a plant using only nuclear fuel to an average cost of $233 per kw for a combination of a nuclear boiler and a separate oil fired superheater.

Because the rapid growth of the system load makes it necessary to continue building conventional steam generating units while obtaining experience in building and operating a nuclear unit, the cost of the incremental capacity gained by superheating before and after credit for lower heat rate may be compared with a cost of $200 per kw for new conventional generating capacity in New York City. The use of superheat will also reduce the maintenance costs on the turbine as compared with a unit operating on wet steam throughout.

Table I—Estimated Costs and Capacities

	Total Plant Cost	
	Saturated Steam	Superheated Steam
Steam pressure at boiler, psia	420	420
Steam pressure, turbine inlet, psia	405	370
Steam temperature, turbine inlet	446	1,000
Gross electrical output, kw	140,000	236,000
Turbine plant heat rate, Btu/kwhr	12,900	10,700
Total cost of plant, million $	45	55
Total plant cost per kw, $	322	233

Table II—Incremental Data on Superheating

Increased capacity due to superheating, kw	96,000
Increased cost due to superheating, million $	10
Cost per kw of increased capacity resulting from superheating, $	104
Heat rate of incremental capacity due to superheating, Btu/kwhr	7,700
Cost per kw of incremental capacity adjusted for better heat rate versus heat rate of best conventional station of 9,500 Btu/kwhr, $	74

Table III—Estimated Annual Costs

Gross heat capacity, reactor, Mw	500
Cross electric capacity, reactor, Mw	140
superheater, Mw	96
Total, Mw	236
Annual net production (80% load factor) reactor, thousand Mwhr	910
Superheater, thousand Mwhr	623
Total, Thousand Mwhr	1533

Annual Costs	Amount	Mills per kwhr
Fixed Charges $55 million @ 13.5%	$7,430,000	4.85
Fuel, nuclear and oil	4,650,000	3.03
Operation and maintenance	1,500,000	1.00
Total	**$13,580,000**	**8.88**

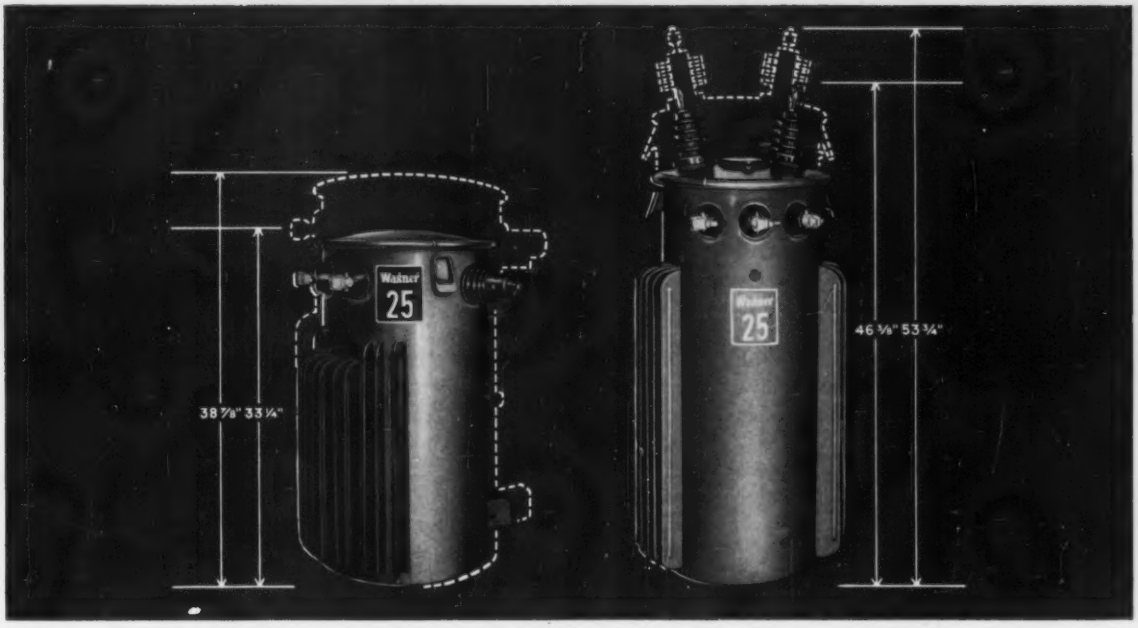
The control rod drives will probably be of the hydraulic type, with scram action initiated by a hydraulic unloading valve. Scram force will be provided by the pressure in the reactor acting on the piston area of the extension shaft. This may be augmented by spring force or by a hydraulic accumulator. Snubbers will be required to decelerate the control rod assemblies near the end of the scram stroke.

The reactor pressure vessel is a cylindrical shell of carbon steel about 10 ft in diameter and about 23 ft high. The inner face of the vessel will be clad with type 304 stainless steel because of its contact with the highly corrosive coolant.

The vessel is set vertically in its containment shell. A skirt-type support permits temperature expansion of the vessel while holding it firmly in position.

The containment shell will be filled with demineralized water to a depth of 18 ft above the closure head of the vessel. This water will provide shielding during normal operation of the reactor and will also

(*Continued on page* 20)



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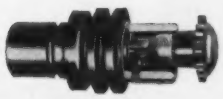
Now Wagner Form W Distribution Transformers are substantially smaller and lighter than ever before . . . up to 25% shorter in the important overall height dimension—17% lighter in weight. Yet they are liberally designed for excellent electrical performance.

This means greater ease of handling—speedier installation. It also means that you can save money by putting greater transformer capacity on your existing structures . . . handle heavier loads without installing new poles. All these new Form W Transformers, in ratings 15 through 167 Kva, 15 KV and below, can be pole mounted.

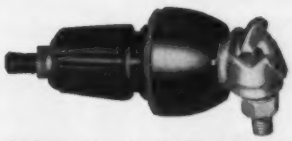
Such reductions in size and weight are made possible by improvements in core and coil construction. A special resin coated insulating material is used for layer, channel and barrier insulation. Heat treating bonds this insulation to the coil conductors to give the coils exceptionally high mechanical and electrical strength.

These new, lighter shorter Form W Transformers will meet your distribution requirements. Consult the Wagner Sales Engineer in your area for complete information.



HIGH VOLTAGE SIDEWALL BUSHING

For use with either copper or aluminum conductor . . . safety-designed for faster, easier connections, without tools. Porcelain and terminal are locked in position.



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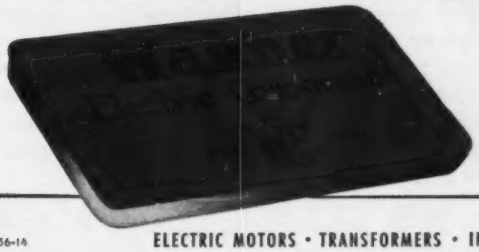
The bushing and terminal are key-locked to prevent rotation . . . on loose terminal connections to cause internal shorts. Suitable for copper or aluminum conductor.

SHUR-SEAL CLAMPING RING

Keeps transformers sealed air-tight . . . no atmospheric moisture or dust particles can get inside.

INHIBITED OIL—reduces oxidation to a minimum . . . retards formation of acids and sludge.



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protect manipulator personnel during fuel loading and unloading stages. The thermal insulation around the outside of the vessel is sealed in a jacket of carbon steel clad on the outside with stainless steel. The outer surface of the closure head is waterproofed by an application of stainless steel, and each stud and nut is chrome plated to eliminate corrosion. In fact, all carbon steel and other materials susceptible to corrosion by the purified water of the containment shell are protected by stainless steel in some fashion.

Because the energy absorbed by the water shield will be considerable, a heat removal system consisting of a single vertical coil of tubing carrying cooling water is provided.

The primary coolant system consists essentially of four loops operating in parallel, each transferring one-quarter of the total power generated by fission in the reactor core to the steam system. Each loop is comprised of a boiler, two 15,000 gpm pumps with associated check valves, 24-in. stainless steel pipe, and two 24-in. remotely operated stop valves to permit isolation of the loop. As has been stated, the coolant is demineralized ordinary water under a pressure of 1,500 psia.

The auxiliary equipment includes the pressurizer and the water makeup and purification equipment.

The reactor is located at the low point in the system. This permits drainage of a boiler loop without uncovering the core and facilitates natural convection removal of decay heat in the event of pump failure.

The pressurizer is located at the high point of the system. This facilitates venting, filling, and pressure control. Pressure is applied to the system by a steam head in the upper part of the pressurizer. The steam is created by cartridge type electric heaters.

Each boiler consists of two major components: an evaporator section and a separate steam drum. The evaporator section consists of U-shaped stainless steel tubes, the ends of which are welded into heavy tube sheets, enclosed in a U-shaped carbon steel shell. This design eliminated the need for an expansion joint in the shell.

Natural Circulation To Be Used

The primary coolant flows through the tubes. Steam is generated in the water surrounding the tubes and flows up to the steam drum, which is sufficiently elevated to create natural circulation through riser pipes. Both riser and downcomer pipes are large enough and numerous enough to permit natural circulation. Steam separators, complete with plate-type scrubbers, are installed in the drum to insure dry steam.

With feedwater at 332F, each of the four boilers will generate about 472,000 lb of saturated steam per hr at a pressure of 420 psia under full power conditions. The total output, then, will be 1,888,000 lb of steam per hr, or 500 Mw of heat. As load is varied, the reactor will be controlled to maintain constant steam pressure.

These units will generate steam at a rate commensurate with the heat supplied to them even at loads significantly less than 500 Mw. Thus, during emergency cooling periods as well as during normal reactor operation, they will serve as a good heat sink, removing excess heat from the system at a rate which will cool adequately the reactor and the other components.

During shutdown heat will continue to be generated in the fuel elements of the reactor by radioactive decay of the irradiated material. Normal shutdown procedures are such that the elements are cooled by forced convection until they are able to be cooled by natural circulation. In the event of power failure, emergency drives attached to one main cooling pump in each loop will supply adequate circulation during the danger period.

The two main coolant pumps in each of the four

(*Continued on page* 24)

Is the Site Adequate?

The plant will be built on approximately 350 acres of land located about 24 miles north of New York City and on the east bank of the Hudson River. The area is relatively sparsely populated. There are no residences or industrial plants within a one-quarter mile radius of the proposed plant and within a half-mile radius there are no industrial plants and only 16 one family houses. Within a five-mile radius there are about 45,000 inhabitants. The site is a rocky promontory extending out into the river.

The adjacent Hudson River provides adequate condenser cooling water and a means for transporting fuel oil to the plant. Plant is about 10 miles from the point of connection on the 138-kv line which forms the backbone of the Con Ed transmission system in the northern part of its service area.

Other site features which are of particular importance for a nuclear power have been investigated and reported as follows:

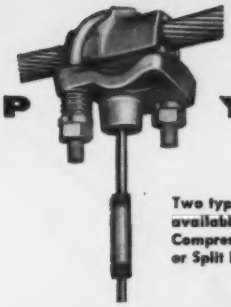
Seismological, ". . . the area should be as free of earthquakes as any known area in the world," Rev. J. J. Lynch, head of Fordham University's Seismic Laboratory.

Hydrological, ". . . with safety features of the plant as reported to me, there appears to be no possibility of radio contamination of the Hudson River or of the public water supplies in the area," Carl Kennison, consulting engineer and chief engineer of the New York Board of Water Supply.

Geological, ". . . rock at the Indian Point site properly grouted, would support any structure that man might build," Sidney Paige, retired professor of geology, Columbia University.

As indicated in the article meteorological studies are still underway.

A U-BOLT CLAMP YOU CAN WORK HOT!



Two types of taps available: with Compression Fitting or Split Bolt

BLACKBURN

Here's a hot line clamp for large aluminum mains with all the advantages of a U-bolt connection. Reduces costly service calls and burn-downs. Costs more than conventional hot line clamps—*and worth it!*

Castings and hardware of aluminum alloy. Standard tap of tin plated bronze—compression tap of aluminum.

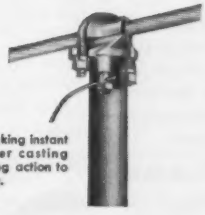
Main—1/0 to 336.4 ACSR
Standard taps—6 AWG to 2/0 AWG
Compression taps—6 to 1/0 ACSR

Patent Applied For

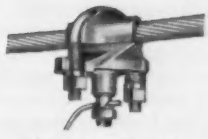
SWIVELOK

Hang over conductor with shotgun stick...

Slam it home and let up on stick.



Up it pops, making instant contact. Lower casting provides wiping action to prevent arcing.



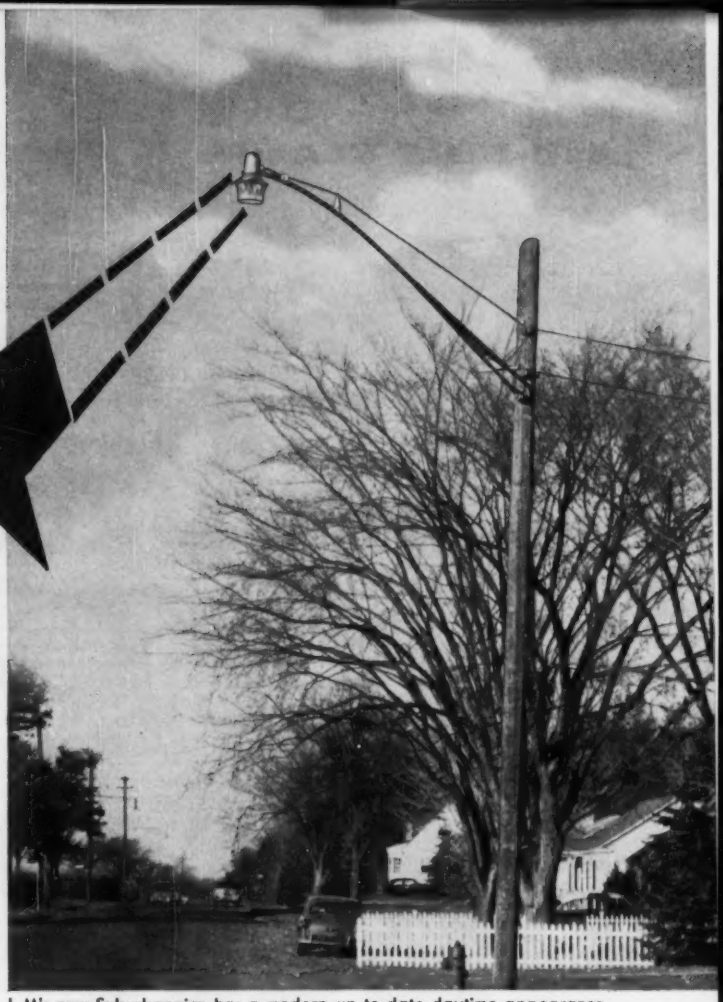
Tighten nuts with socket wrench in stick and you have a trouble-free connection.

Send for your FREE SAMPLE Today!

JASPER BLACKBURN CORPORATION

35 MADISON STREET • ST. LOUIS 6, MO. • PHONE MAIN 1-2821

Aluminum reflector can be latched directly to a standard NEMA head. Since the Suburbanaire is open at the bottom, the refractor does not need to be removed for relamping.



L-M's new Suburbanaire has a modern, up-to-date daytime appearance.

How L-M's Suburbanaire Improves Residential Lighting, Cuts Maintenance

L-M's new open-refractor Suburbanaire is an outstanding improvement in residential area luminaires. The open glassware provides for excellent cooling, larger lamps, and easy re-lamping. In addition, the Suburbanaire has a pleasing daytime appearance.

The Holophane® refractor glassware is available in type I, standard type II, type II 4-way offset, type III and type V light patterns. The unit offers greatly improved lighting over open luminaires often used for neighborhood streets.

Check These Outstanding Features

L-M's Suburbanaire Is More Efficient—

- Specially designed for long life, low wattage, and clear and color improved mercury vapor lamps including the new 100 watt (3300 lumens) and 175 watt (6800 lumens). Accommodates incandescent lamps up through 6000 lumens. Integrally mounted head and ballast assembly available for use with HG lamps.
- Provides more light at higher angles, making it adaptable to wider spacings which are typical in residential areas.
- Glare is at a minimum, even with high beam candlepower at a high angle, because of the large glass area, which provides a beacon effect with large light source. The light is developed from the entire refractor, not just from the area next to the reflector.
- Has high utilization of light output and improved efficiency.

L-M's Suburbanaire Cuts Maintenance Costs—

- Eliminates the problem of trapped dirt and condensation which collect in enclosed units.
- Relamping can be done without removing glassware. In many cases it can be done from the ground with a lamp stick.
- Alzak® aluminum reflector is latched for easy attachment to standard NEMA head. V-band permits field replacement of glassware when necessary.

Ask the L-M Field Engineer or Street Lighting Engineer for more information on features of L-M's Suburbanaire luminaire. Or write Line Material Company, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

LINE MATERIAL

A McGRAW ELECTRIC COMPANY DIVISION

Street Lighting

267

When ordering lighting equipment, protect yourself. Insist on quality products that meet the exacting requirements of EEI-NEMA standards (Edison Electric Institute and National Electrical Manufacturers Assn.)

L-M's modern 1957 fluorescent luminaire is styled for handsome appearance, correct light distribution, and a lifetime of efficient, economical operation. It is the only fluorescent luminaire designed to take both present and future very high output fluorescent lamps.

Line Material Announces New, Advanced 1957-Style Fluorescent Luminaires

L-M's new fluorescent luminaires offer an exciting new look in street lighting equipment. The units provide more comfortable visibility, and greatly increase the scope of vision for both motorists and pedestrians.

L-M's new luminaires are the only units available today that are designed to take both present and future VHO (very high output) fluorescent lamps.

The new luminaires have a long, slim modern look, and retain all the outstanding performance characteristics of L-M's original design. Their broad, cool, white light source provides virtually glareless illumination —the ultimate goal in lighting.

L-M's modern fluorescent luminaire distributes the light over a broad area, giving good balance between building and road surfaces.

These new street lighting luminaires are available in deep and shallow styles, in both four- and six-foot lengths. For other outdoor lighting applications, such as parking lots, store front lighting, etc., other styles are available.

Get Complete Information

Get details of L-M's new 1957-style fluorescent luminaires. L-M Street Lighting Engineers will cooperate with you in designing the best lighting system for your area. Ask your L-M Field Engineer or Street Lighting Engineer for more complete information. Or write Line Material Company, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

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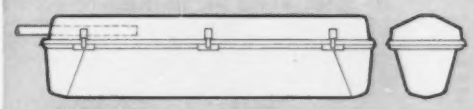
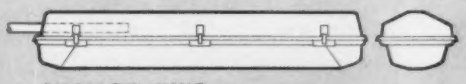


DEEP UNIT



SHALLOW UNIT

Deep and shallow units are available in both four- and six-foot lengths. L-M's new fluorescent luminaires provide excellent light distribution for all applications.

LM® **LINE MATERIAL** *Street Lighting*

A McGRAW ELECTRIC COMPANY DIVISION

Con Ed's Reactors Show Promise (*Continued from page* 20)

circuits operate in parallel. Normally they operate at constant speed for all reactor loads. As stated, however, one pump in each loop can be operated at low speed from an emergency power supply. The pumps are of the canned rotor type.

There will be three main sources of power to the pumps: two system high lines and the plant generator. There will be three pumps on one of the high lines and on the plant generator and two pumps on the other high lines. The loss of any two sources of power would leave a minimum of two pumps operating at full speed, one in each of two circuits. The loss of all three sources of power will activate switchgear to switch the four two-speed pumps to auxiliary power on the vital bus. These four pumps, one in each circuit, will operate off the vital bus until main power is restored. The two-speed motors on these pumps have the second speed sized so that there will always be ample flow through the reactor, but the speed is reduced as much as possible to minimize the load of the vital bus.

In order to inhibit the plating out of corrosion products in the reactor, a concentration of about 20 cc of hydrogen per liter of water will be maintained in the primary water. It is expected this water will have a pH of about 8.

All four boiler loops will be adequately contained in vessels designed to hold safely the vapor released through a mechanical failure of any pressure part in the coolant system. Two 80 ft diameter spheres each contain two loops. The spherical containers are connected to the vapor space of the reactor containment shell and to each other by means of large ducts. In order to avoid the possibility of radioactive air pollution in the event of a nuclear incident, no fresh air will be introduced into the containers. A closed circuit air conditioning system will cool and dehumidify the residual air.

The feedwater heating system consists of four stages with three closed feedwater heaters followed by a deaerating type heater for the removal of oxygen. The heat rate for the steam cycle exclusive of reactor efficiency is 10,700 Btu per net kwhr produced.

The general layout of the plant follows the general arrangement used for the company's conventional steam plants, with the nuclear reactor replacing the conventional boiler. The arrangement provides for the addition of future generating units while still permitting economical use of common items such as the turbine room crane, control room, and general service facilities.

France-England Plan for DC Link Okayed

For over a decade French and British engineers have theorized, tested, and argued about the best way to link their electric networks. According to a joint announcement by the nations, the puzzle has finally been solved.

Work is to begin early next year on an underwater dc cable, which will transmit between 120 and 150 Mw at 200 kv. Barring any major setbacks, by 1960 a London flat may be lighted by power generated in the French Alps.

Engineering and financial interest in the project lies in the varied daily and yearly peak demands of the countries. Allowing for the project's cost of about $11.2 million, France and England expect savings in generation construction of up to $25 million.

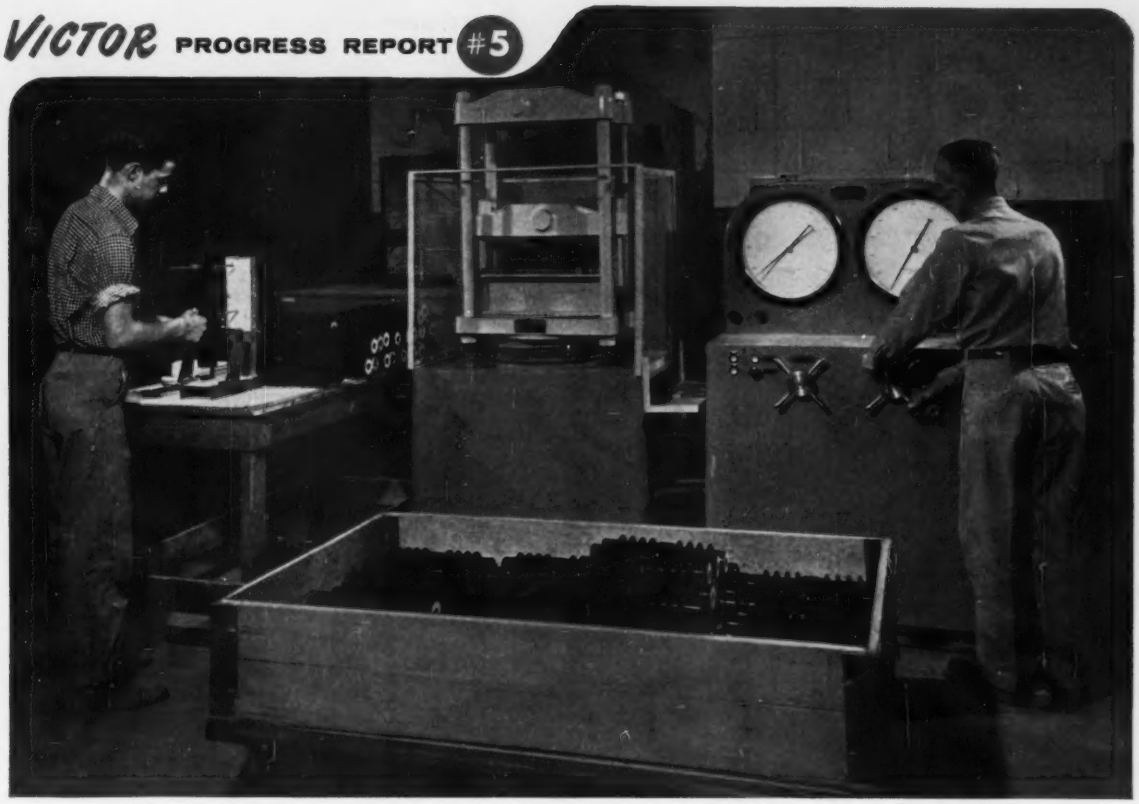
In 1951 studies indicated 150-Mw, 3-phase, ac cables would do the job. Large-scale testing followed. But recent developments in dc transmission—notably the success of 100-kv, 62-mi link between Sweden and the island of Gotland, and refinements in high-power mercury vapor mutators—brought demands for new studies. Comparison favored the single-cable dc plan over multiple ac cables. The dc link will allow both systems to control their frequencies independently and to regulate agreed load interchanges with greater precision than with ac.

Rep Earl Chudoff to Probe Power Policy in California

Rep Earl Chudoff (D-Pa.) will resume investigating the Administration's power policies Sept. 24-25—this time at Roseville, Calif. Subject of hearings: "Availability of power for the city of Roseville from the Department of Interior's Central Valley Project in California."

Chudoff said the hearings were requested in June by Rep Clair Engle (D-Calif.). Chudoff charges that Roseville has tried, without success, to get some of the 150 Mw of firm power added to the Central Valley Project by the recently completed Folsom and Nimbus Dams.

VICTOR PROGRESS REPORT #5

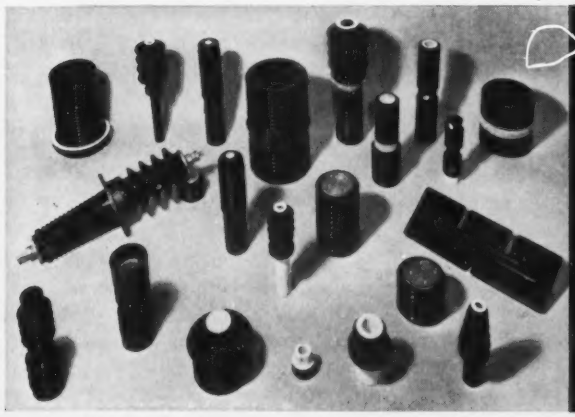


VICTOR
PURIFIED PORCELAIN

the Industry's standard for Special Shapes!

The hydraulic testing machine shown above is located in Victor's special porcelain testing department. Insulators such as these open cutouts are given a calculated transverse load before electrical test. The inspector on the left is checking hole alignment.

Starting with *Purified* Porcelain—finest insulator porcelain ever made—all special shapes made by VICTOR undergo rigid quality controls, tests and inspections to assure users of the best insulating materials money can buy. If you need special shapes required in cutouts, circuit breakers, potheads, capacitors, switchgear, transformers and other electrical equipment, choose the best! Choose VICTOR!



SPECIFY VICTOR
Purified Porcelain Insulators!

VICTOR INSULATORS DIVISION
I-T-E CIRCUIT BREAKER CO.
VICTOR, N. Y.

Low and High Voltage Pintypes • Suspensions • Guy Strains
Spools • Switch and Bus Insulators • Custom Designed Porcelain
Insulator Hardware

All-in-One Billing System Saves

Kansas P&L's improved techniques cut $7,000 a year from former expense of billing and customer accounting

FULL BILLING JOB is now handled in a single pass through an IBM 407 accounting machine; whereas in the procedure formerly used the job required three runs

HERMAN F. SCHUSTER, Tabulating Supervisor, Kansas Power & Light Co, Topeka, Kan.

An all-in-one system enables Kansas Power & Light Co to handle utility billing and customer accounting in about a third of the former tabulating-machine time and at savings approximating $7,000 a year. One tabulating machine in the central billing office in Topeka does a job that formerly took three machines.

Moreover, the company can register an additional, virtually cost-free advertising message impact on every subscriber every month.

This procedure revolves around a form which, at a single writing, provides for all customer accounting needs. Under the operating set-up, there are three basic documents in customer accounting:

1. The bill.
2. The accounting record for the responsible branch office.
3. The transmittal of meter reading and usage information to Topeka as the basis for the next month's billing.

Topeka Handles All Billing

All billing is handled in the tabulating department in Topeka. Collections are the responsibility of 42 branches. The company services some 180,000 electric and 90,000 gas meters in 330 communities. In addition, wholesale electric service goes to 22 municipalities and 18 cooperatives.

In accounting terms the system furnishes the company with 220,000 bills a month. Management has assigned the mechanics of accounting to the home office while customer contact records and functions are retained by the branches. Meter books remain in the field offices, and the basis of the billing is a separate transmittal record.

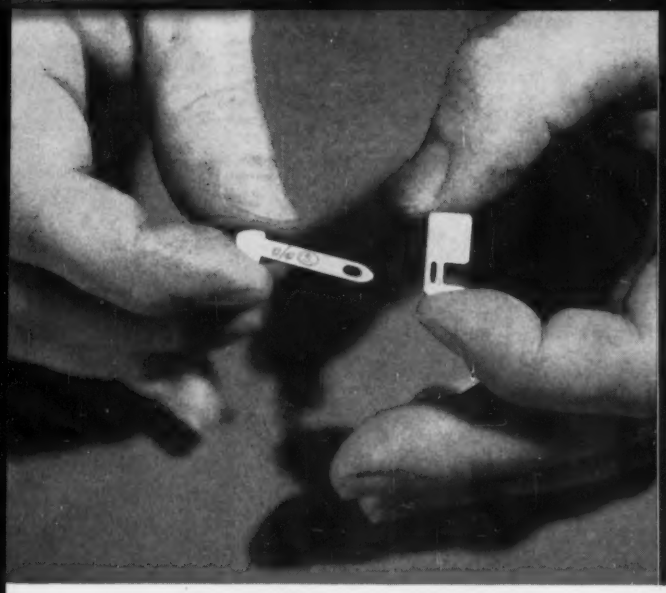
Customer usage records are sent to Topeka under a schedule calling for processing of bills in 20 monthly cycles. The branch office covers each group of records with a recap sheet against which the tabulating operations balance. These records contain notations of all changes of service on each meter reading route.

Cards Punched in Route-Book Order

When the records are received, the home office first punches new master cards covering service changes. The office maintains customer master punched cards, by route, for the entire territory. These change cards are interfiled with a working deck of advance cards, pre-punched to include all repetitive information along with data on the previous month's meter reading for each account. In order that home office operations dovetail smoothly with those of the branches, the advance cards are set up and processed in route-book order.

While the advance cards are fed through key punch machines, operators quickly enter figures for the new meter reading and monthly usage for each account. This is the only manual clerical processing for setting the billing cycle in motion. Even verification of key punching is automatic, programmed

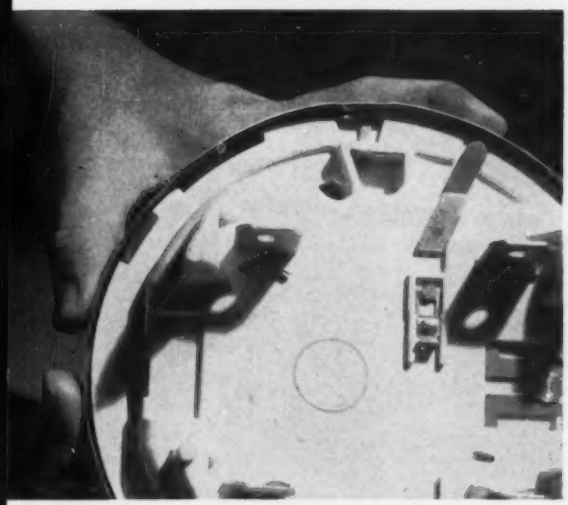
(*Continued on page* 31)



THE NEW SANGAMO OK SEAL is simple in design. It consists of two parts, made of almost pure aluminum and treated to resist corrosion.

SEALS ARE SIMPLE TO INSTALL. Sangamo meter sealing tools are available for you. But these seals can easily be closed with a screwdriver.

Ready for Shipment... and ready for use- SANGAMO J2 METERS



NO MORE COSTLY THREADING OF LEAD SEALS. You can seal meters faster, cheaper with the Sangamo OK Seal. Your shop tested meters stay sealed—as calibrated.

When a Sangamo J2 Meter leaves the factory, it has been so accurately calibrated on the Sangamo Comparator that it is shipped *sealed*—ready for use. No adjustments are necessary. The Sangamo OK Seal assures accurate calibration.

This easily removed, non-reusable seal provides an economical means of sealing meters. It eliminates the time-consuming, costly threading of lead button seals both in the factory and in your shop.

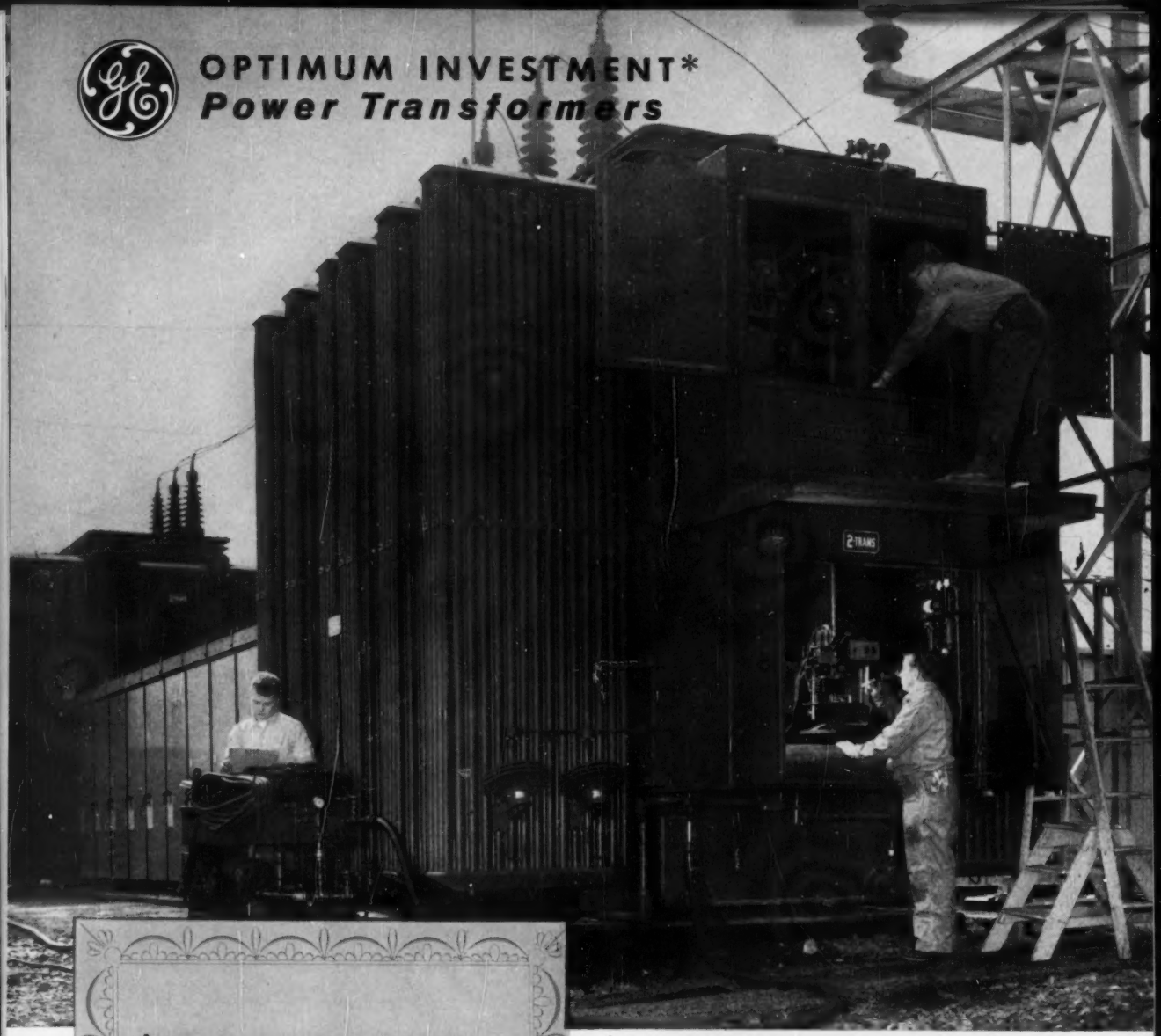
If Sangamo meters are opened, they can be easily and inexpensively resealed with the Sangamo time saving seal or with a conventional lead button seal. Sangamo OK Seals are competitively priced—available for your use. Write for further information and prices today.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

JM56-6

OPTIMUM INVESTMENT*
Power Transformers

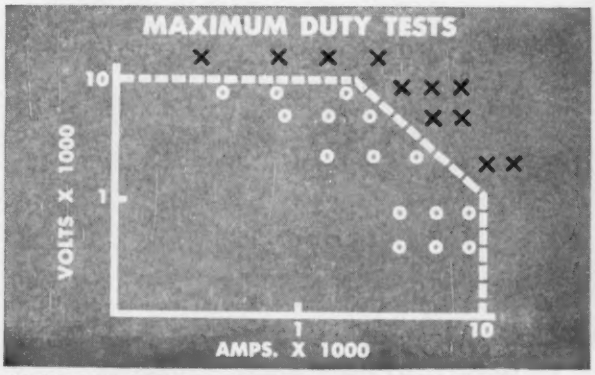


*Optimum Investment

Your assurance of lower long-term cost, plus greater dividends from your investment in General Electric large power transformers, through:

- **LOW ENGINEERING COST:** G-E field services reduce your engineering expense.
- **LOW PURCHASE COST:** Skill to produce optimum design for each application.
- **LOW INSTALLATION COST:** Upright shipment, one-piece tank speeds handling.
- **LOW OPERATING COST:** Permanent, better characteristics for lasting economy.
- **LOW MAINTENANCE COST:** Product improvements, greater reliability reduce outages.

G-E LTC EQUIPMENT now has 4 times the tip life of 1936 mechanisms. Maintenance, when needed, is simplified by hinged doors, roomy accessibility, and reusable Nitrile gaskets. Shown above is 15,000-kva, 69-kv unit.



SHORT-CIRCUIT DUTY is an important, extra feature of G-E LTC equipment. Each mechanism is thoroughly tested and applied only where test data (circles) proves ability to successfully operate under short-circuit conditions.

In the next five years . . .

Utilities will save $2,000,000 capitalized cost of reduced load-tap-changer maintenance

300% increase in LTC contact life in 20 years results from improved General Electric product features

Utilities have reported they spend an average of $200 each time they inspect and/or maintain LTC equipment. This is necessary about every three years. Yet today, General Electric load-tap-changers have an average of four times the tip life, for equal applications, compared to twenty years ago. On this basis and for the number of LTC equipments General Electric will ship in the next five years, assuming a 12% capitalization rate, electric utilities will save over $2,000,000 capitalized cost of LTC maintenance.

New and better design features developed by General Electric have made such savings possible. Heavier and thicker Arconite contact tips wear longer before replacement is necessary. Electrostatic shielding along panels and insulating rods breaks up creepage paths and eliminates the need for sporadic maintenance. Electrical and mechanical soundness is proven by the ability of mechanisms to complete a tap change even under short circuit—with no damage.

These and other G-E advances, such as those that reduce repaintings and prolong oil life, reduce your maintenance expense. And, combined with other features that give you low operating, purchase, engineering, and installation costs, they make your General Electric Power Transformer an *Optimum Investment.* General Electric Co., Schenectady 5, New York.

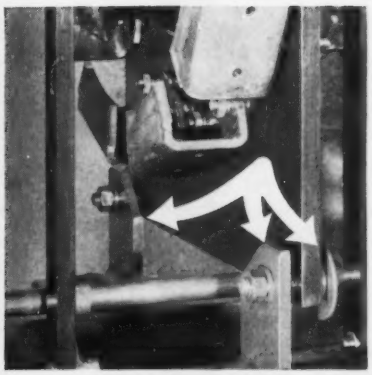
421-41

IMPROVEMENT OF LOAD-TAP-CHANGER PERFORMANCE

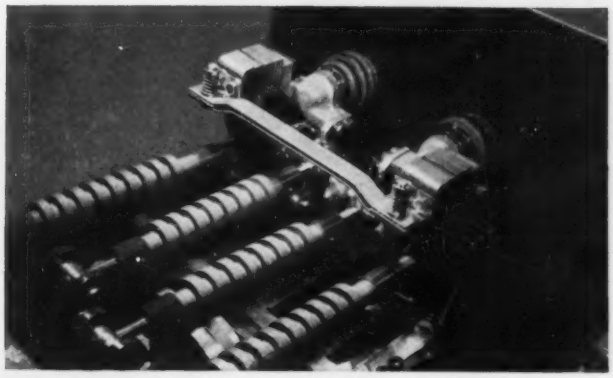
TYPICAL TRANSFORMER APPLICATIONS			EXPECTED TIP LIFE—Number of Operations	
KVA —MAX.	HIGH VOLTAGE —KV	RANGE —Per Cent	1936	1956
10,000	69 GR Y	±10	55,000	500,000
25,000	67 △	±10	70,000	140,000
55,000	115 GR Y	±10	30,000	160,000
92,000	110 GR Y	±10	40,000	65,000
166,700 (output)	230 GR Y	±7.5	24,000	50,000

Progress Is Our Most Important Product

GENERAL ELECTRIC



ELECTROSTATIC SHIELDING by collars (right), washers and projected supports (left), reduces excessive maintenance cost by diverting "particle-attracting" electrostatic stress so creepage paths are not formed along insulation.



ARCONITE CONTACT TIPS last longer; life is further extended by controlling contact speed. Life of contacts, insulation, and mechanical parts; plus normal and short-circuit duty requirements, are completely co-ordinated for every application.

Save As Much As Half . . .
Get Finest Protection . . .
with THOREX ARRESTERS

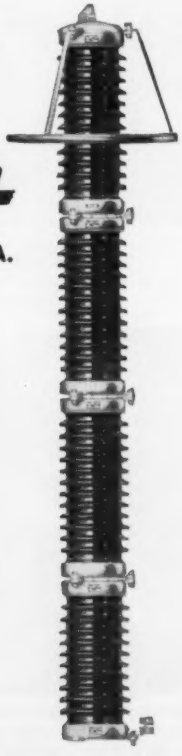
You can build a 230-kv Thorex lightning arrester on no more than these small bases. You don't need any overhead or side external support. This is all there is to it!

What do these simple bases cost compared to the expense of designing, fabricating and erecting special steelwork? In other words, consider the ultimate low price of a Thorex arrester--sometimes hardly more than *half the installed cost* of supported types.

And look at the simple, unobstructed, columnar form of the Thorex. It takes substantially less station "real estate" and reduces length of leads to protected equipment--a valuable asset.

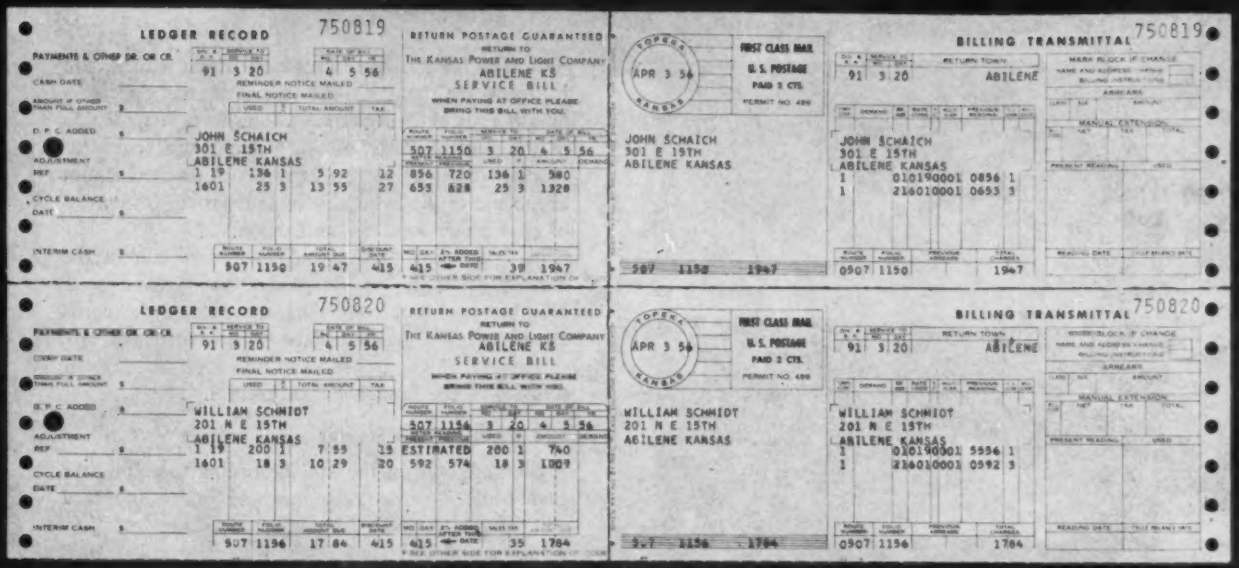
With low cost and convenience of the Thorex goes the best combination of basic protective characteristics you can buy in a lightning arrester today.

Save money with no penalty--actually a premium--by protecting your major apparatus with Thorex lightning arresters.



Ohio Brass

MANSFIELD OHIO, U.S.A.



All-in-One Billing System Saves (*Continued from page* 26)

into the IBM 607 electronic calculator.

For processing in the calculator, cards are sorted according to rate code. The 607 is wired to apply any of four or five rates in its calculations, taking its cue from a single-digit rate code carried over from the customer master card. In a single pass, the calculator:

1. Multiplies the reading for the affected meter for the previous month by its multiplier. (The multiplier is the factor by which the measured consumption of a meter must be multiplied to arrive at actual usage. Some electric meters measure only a fraction of the current, the multiplier developing the actual usage figure).

2. Multiplies the current reading by the multiplier.

3. Subtracts the old reading from the new to obtain a value for current usage.

4. Compares this figure with the key punched usage amount as an automatic verification. The 607 uses its own figure in further calculations; but when the usage amounts fail to match at this point, the machine automatically segregates the card for more checking.

5. Extends "usage times rate" to produce a billing amount. In making this extension, the machine automatically takes into consideration the number of days of service for pro-rating of accounts and compares its answer with minimum service charges which might apply.

6. After arriving at the net billing amount, the 607 figures the tax and total due.

7. Finally, the 607 retraces all its steps, proving every answer before passing on to the next card.

The 607 processes all these calculations at approximately 100 cards per min. Some 14,000 cards a day go through this machine on customer billing work alone. Once extended, the cards are sorted in route order number and summarized to facilitate preparation of the monthly journal entry and periodic reports to governmental agencies. This summarization serves also to produce figures contributing to the company's overall operating revenue statements. Summary cards, produced while these cards are in route order, enable the department to handle further processing of these lump sum figures with fewer cards.

Reports Give Totals by Route

Among other things, these reports give totals, by route, for kwhr, cubic feet, and cash, against which bills are balanced before release. After these reports have been written, cards are collated with master decks of name and address cards to produce the bills.

Bills are run on an IBM 407 accounting machine using forms designed with the aid of the Standard Register Co. A full 16 in. wide, the new bills are continuous, marginally-punched forms printed on card stock. Width and weight of the stock make precision printing and careful quality control mandatory.

The company's experience with millions of bills, however, has established that these forms can be run over the 407 to extremely close tolerances.

The 407 is wired to print similar or identical information in three separate places in different sections of the bill, which is really three forms in one. The three parts, separated after writing on a burster-imprinter, are:

1. The bill, imprinted in the center section of

TWO ENTRIES constitute the home office clerical work connected with rendering bills. Current meter reading and usage go on the card covering each customer

the form, which separated becomes a 5½-in.-wide postcard. The 407 imprints this form with a postage meter date and renders it ready for mailing. The card is divided in half somewhat like the business side of a picture post card. The right-hand portion bears the customer's mailing address, the left-hand, a fully itemized bill. The reverse side is blank except for a company signature and a key to rate code numbers. An advertisement is printed in this space as the forms run through the burster-imprinter. This printing does not retard separation of the cards at approximately 12,000 per hr. The only expense for this advertising is a rubber plate and the ink.

2. The billing transmittal card which will be sent in from the field as the basis of the following month's customer accounting. This form has a listing of the current status of the account and space for branch office personnel to report back on the account at the end of the month. It includes room for entries of new meter readings and usage.

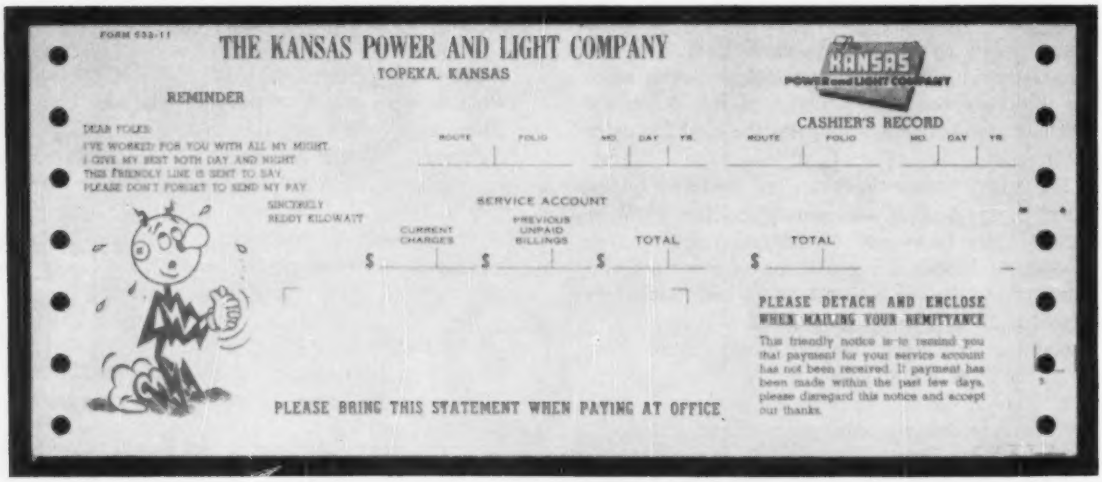
3. A ledger card, placed in a card file in the branch office as the basis for the accounts receivable operation. As bills are paid, these cards are pulled, the account status is balanced in blank spaces for this purpose, and the card is filed in support of the branch's cash journal.

Old Method Was Slower

Bills are run on the 407 according to route. As each route is closed, the machine prints one card with route totals which are checked against previously established trial balances before the bills are released. After the forms have been run over the burster, bills go to the post office on their proper cycle date and transmittal and ledger record forms to the responsible branch.

Formerly, these procedures took three tabulating runs to complete the billing cycle, and the old bill required two runs. On the old form the name and address only were printed on one side and the billing information on the reverse which now carries the advertising message. Besides doubling machine time, this method called for extreme operating precautions. Cards had to match perfectly for the separate runs imprinting reverse sides. With one card in the deck out of place, records for an entire route were worthless.

After the bills were out, the old method called for running off a separate branch office ledger record, long sheets with columns where branch office personnel entered cash data on receipt of payments.


FORM 553-11
THE KANSAS POWER AND LIGHT COMPANY
TOPEKA, KANSAS
KANSAS POWER and LIGHT COMPANY
REMINDER
DEAR FOLKS:
I'VE WORKED FOR YOU WITH ALL MY MIGHT.
I GIVE MY BEST BOTH DAY AND NIGHT.
THIS FRIENDLY LINE IS SENT TO SAY,
PLEASE DON'T FORGET TO SEND MY PAY.
SINCERELY
REDDY KILOWATT
CASHIER'S RECORD
ROUTE
FOLIO
NO.
DAY
YR.
SERVICE ACCOUNT
CURRENT CHARGES
PREVIOUS UNPAID BILLINGS
TOTAL
TOTAL
PLEASE DETACH AND ENCLOSE WHEN MAILING YOUR REMITTANCE
This friendly notice is to remind you that payment for your service account has not been received. If payment has been made within the past few days, please disregard this notice and accept our thanks.
PLEASE BRING THIS STATEMENT WHEN PAYING AT OFFICE

EXCLUSIVE NEWS:

WESTINGHOUSE METAL-CLAD SWITCHGEAR . . .

FIRST 75 MVA MAGNETIC AIR BREAKER—5-CYCLE INTERRUPTION

A jump ahead of demands on modern switchgear, Westinghouse announces an air circuit breaker rated at 75 MVA interrupting capacity. And more—5-cycle operation means fast arc extinction.

This new 50-DH-75 breaker offers:

1. The long-proved, exclusive Westinghouse De-ion® arc interrupter, the fastest, most efficient method of arc extinction ever devised.

2. Main contacts are self-aligning, multiple line, butt type.

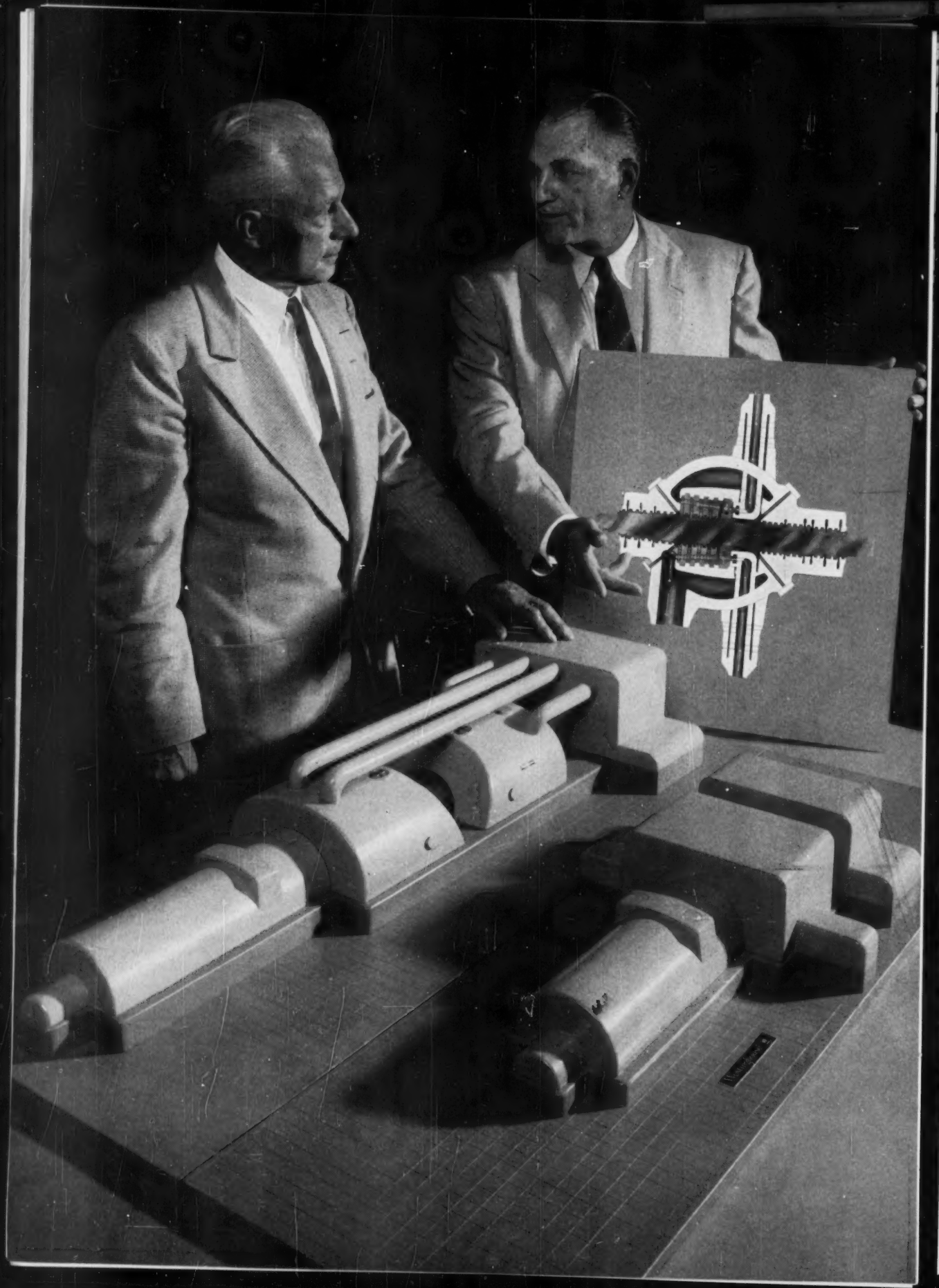
3. New lightweight, hinged-type arc chute that has improved arc interruption. Inspection of contacts is now even simpler—remove just one bolt and tilt back arc chute.

Specify Westinghouse metal-clad switchgear—now even more versatile, faster, more dependable. Get in touch with your Westinghouse sales engineer, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-60888

John Kozlovic, Design Engineer, High-Voltage Air Circuit Breaker Engineering Section, discusses features of the first 75 MVA magnetic air breaker. New Westinghouse air breaker is rated 75 MVA at 4160 volts, 50 MVA at 2400 volts interrupting capacity; 1200 amperes continuous; 5-cycle interruption.

WATCH WESTINGHOUSE!

COVER THE PRESIDENTIAL CAMPAIGN ON CBS TELEVISION AND RADIO!



Helping the industry meet its growing loads

New 5000-psi turbine-generator will produce world's most efficient kilowatts

In the battle to reduce costs per kilowatt hour, Westinghouse has just scored another victory for electric utilities with a new world-record turbine. This giant unit now on order by Philadelphia Electric Company will operate at a pressure, temperature and efficiency that will surpass all other machines now operating or on order.

Substantial performance gains are expected from the Philadelphia Electric Company turbine. A plant heat rate approaching 8000 Btu's per kwhr will be obtained. This is an efficiency improvement of over 10% above present stations.

Every day Westinghouse research and development works to advance the frontiers of steam progress even further. There is no end to the effort of progressive Philadelphia Electric Company—and the entire electric Utility Industry to meet the mushrooming demand for power—a demand that has doubled every decade. This constant advancement will keep electrical energy today's best buy . . . tomorrow's, too. J-97196

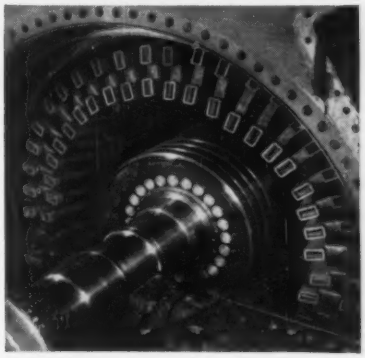
WATCH WESTINGHOUSE!

COVER THE PRESIDENTIAL CAMPAIGN ON CBS TV AND RADIO!

Super critical unit

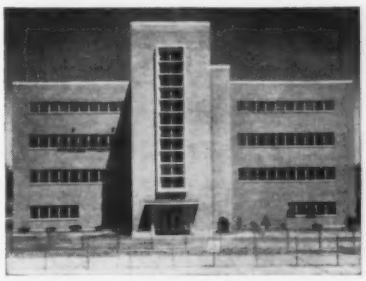
The new 5000-psi, 1200° F. turbine for Philadelphia Electric Company is a cross-compound, four-cylinder unit. It will use double-flow exhaust to the condenser and double reheat to 1050° F.

The two Westinghouse generators will have a combined rating of 416,000 kva, three phase, 60 cycle, 20,000 volts. They will be self-ventilated with shaft-mounted fans, and will employ hydrogen inner-cooling of rotor and stator conductors.



Inner-cooling

Generator inner-cooling represents a tremendous advance in dissipating heat from current-carrying windings. By actually circulating hydrogen *inside* both rotor and stator conductors, Westinghouse engineers have doubled single shaft ratings over conventionally cooled units with greatly reduced size and weight. Already proved in extensive service, inner cooling has become the *key* to even greater generator ratings at a saving in cost. Without the use of inner-cooled conductors, it would be impractical to build the large capacity generators required by the utility industry today. Well over 10,000,000 kva of inner-cooled generators are presently on order at Westinghouse.



Turbine laboratory

Advanced development on steam and gas turbines is being conducted at the new Westinghouse laboratory near Philadelphia. Here, amid facilities that are the most modern in the world, engineers and technicians work to advance the prime-mover art. Out of this laboratory will come the great turbine developments of the future that will help the utility industry produce kilowatts at lowest possible cost and keep Westinghouse in the vanguard of steam turbine progress.

Niagara Mohawk Advances F. J. Schneider

Niagara Mohawk Power Corp has announced the appointment of F. J. Schneider as new operating superintendent of electric operations for the central and northern New York areas. He assumes the post left vacant by the recent promotion of J. Leo Welch to vice president of operations for the system.

Schneider, previously assistant operating superintendent for the Central Division, is a graduate of Clarkson College where he received his degree in electrical engineering in 1932. He began his association with a predecessor company of Niagara Mohawk the next year as foreman in the construction department. Later, upon expansion and consolidation of the company, he served in the engineering department in Syracuse, and in 1952 was appointed electric superintendent for the utility's Central Division. The following year he was named assistant to the general superintendent of electric operations for the system. He was named to his most recent position of assistant operating superintendent in 1954.

F. J. SCHNEIDER

HOWARD R. STEVENSON

FRED A. COMPTON

Detroit Edison Ups Stevenson; Compton Retires from VP Post

The promotion of Howard R. Stevenson to manager of sales and the retirement of Fred A. Compton, vice president in charge of sales, has been announced by Detroit Edison Co.

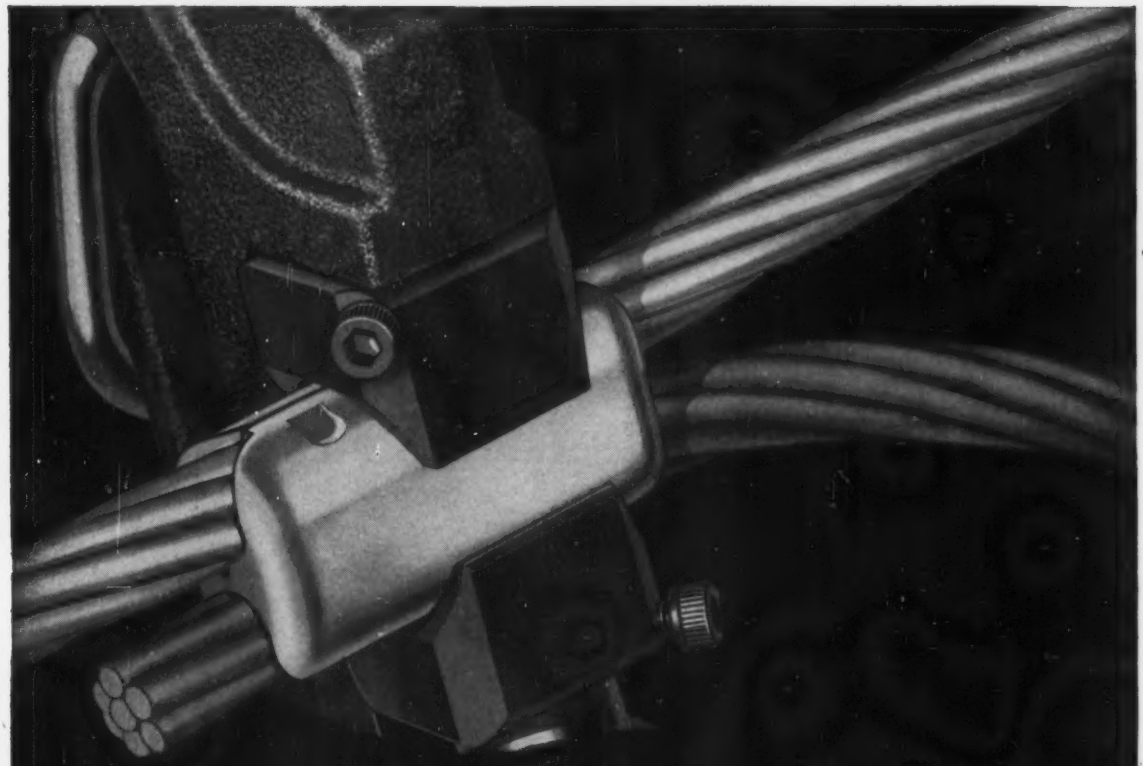
In his new capacity Stevenson, previously assistant manager of sales, succeeds Edwin O. George, who was recently elected sales vice president (EW, July 30, p 36).

Stevenson has been associated wth Detroit Edison since 1928, soon after he received a master's degree in electrical engineering from the University of Michigan. He was subsequently assigned to various supervisory posts in the utility, including assistant superintendent of the Customer Service Division, manager of a Gas Division formerly operated by the company in Port Huron, and assistant commercial manager in Detroit.

In 1952 he was appointed assistant manager of sales and served as assistant manager of operations from 1954 until August of this year when he returned to the sales department.

Compton, vice president in charge of sales since 1949, is a veteran of 42 years with Detroit Edison. In 1914, upon graduation from the University of Michigan with a degree in architecture, he joined the utility as an engineer in the construction department. After service in World War I he returned to the company's construction department in 1919. Four years later Compton was transferred to the company's purchasing department where he became purchasing agent in 1940. During World War II he served as consultant in the Office of War Utilities for the War Production Board, and upon his return to the utility was named sales manager.

Succeeding Stevenson as assistant manager of sales is George L. Lahodny, who will share managerial responsibilities with Thomas J. Peterson, assistant manager since 1952.



for permanent connections...
at less cost

use KEARNEY SQUEEZONS

The exclusive "built-in spacer" eliminates the danger of corrosion or galvanic action. Conductors do not touch each other. Each is held around its entire circumference . . . separated by a metallic barrier. You can use versatile SQUEEZONS for copper to copper, copper to aluminum, aluminum to copper or aluminum to aluminum joints.

JAMES R. KEARNEY CORPORATION • 4224-42 Clayton Ave., St. Louis 10, Mo. • *Canadian Plant:* Guelph, Ont.

-298

for BETTER CONSTRUCTION
SAFER MAINTENANCE
Specify KEARNEY
JAMES R. KEARNEY CORPORATION ST. LOUIS MO. GUELPH, ONT.
The Mark of Quality PRODUCTS

WWP Names Wright to Engineering Post

Jack A. Wright has joined the engineering department of Washington Water Power Co as a special projects engineer to assist in the company's expanded construction program.

Wright, who attended West Texas State College and the University of Washington, was associated with Puget Sound Power & Light Co in western Washington for 10 years, leaving in 1946 to join the staff of the Tidewater Power Co in North Carolina. When Tidewater merged with Carolina Power & Light Co in 1952, Wright was employed by the latter firm as a system planning engineer.

JACK A. WRIGHT

PERSONAL BRIEFS

Newly promoted engineers at Toledo Edison Co are **Wendell A. Johnson,** from associate engineer to transmission design engineer; **Robert J. Nagy,** from assistant engineer to senior assistant engineer; **H. Dean Randolph,** from senior power engineer to power salesman in the Fremont Division; and **Robert E. Lee** from junior power engineer to power engineer in industrial lighting.

Joe M. Phillips, formerly chief clerk of Puget Sound Power & Light Co, has been designated division manager at Olympia, Wash. He succeeds **Frederick H. Anderson,** who has retired after 48 years with the company and predecessors.

Empire District Electric Co has appointed Baxter Springs Manager **Garland Largen** to succeed retiring **Harold W. Field** as manager of the Picher office . . . Retirement of **Julius Hall, Jr,** has been announced by Appalachian Electric Power Co. He was commercial manager until September of last year. Since then he has served the utility in an advisory capacity.

Oscar F. Holmgren has been named to the newly created position of appliance service supervisor of Black Hills Power & Light Co . . . Carolina Power & Light Co has assigned **Rudolph Kirby** as residential sales representative in the Raleigh district.

Recently elected to membership in Controllers Institute of America were **Edward H. Hegmann,** controller of Duquesne Light Co, and **William M. Gwynn,** treasurer of I-T-E Circuit Breaker Co.

Electric Companies Public Information Program has named **R. E. Minshall** of Columbus & Southern Ohio Electric Co, as chairman and **William Saunders** of Detroit Edison Co as secretary of its East North Central Region for two year terms each. Minshall succeeds **John O. Gunn** of Cleveland Electric Illuminating Co, who is now with PIP at Bozell & Jacobs, Inc.

Frank M. Bader has been named manager of Combustion Engineering, Inc, Western Division in Los Angeles. He succeeds **Robert M. Hatfield,** recently appointed vice president and general sales manager of the company.

Curt W. Cuno has been appointed plant engineer of the semiconductor products department, General Electric Co. Cuno received in 1942 GE's highest award for contributions to the company equipment testing procedures . . . GE's recent merger of its sales force into a national organization made **John E. Hogg** Pacific regional manager, **George W. Gamble** sales manager for military applications, **Reinhard H. Huebenthal** sales manager for digital processing applications in industrial and transportation markets, **Owen K. Lindley** sales manager for industrial control and simulation applications, and **Allen M. Sutton** sales manager for digital processing applications in banking and finance.

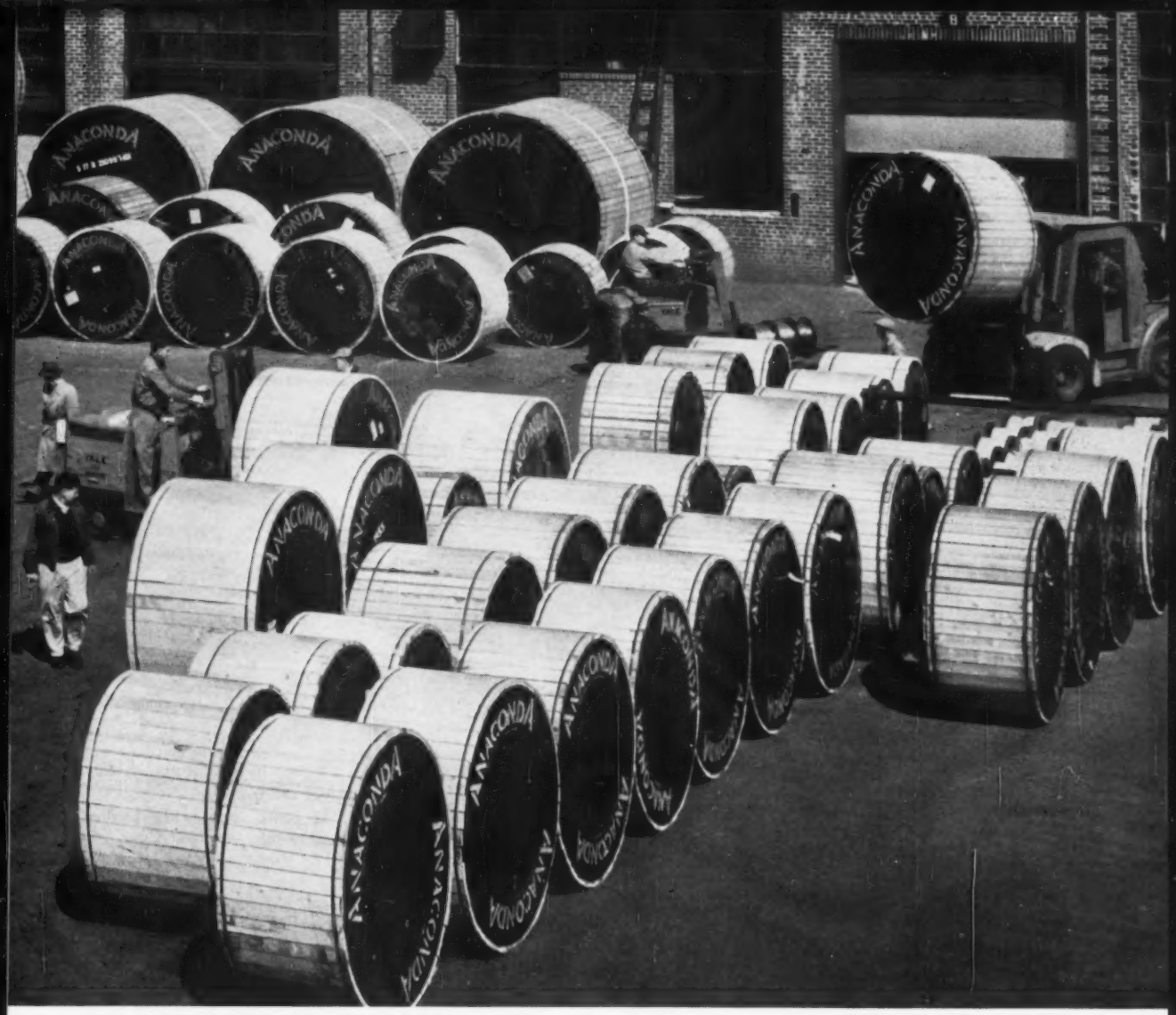
Bryant Electric Co, subsidiary of Westinghouse Electric Corp, has designated **Clyde H. Wood** general sales manager. Wood succeeds **Harold Hey,** retired.

Frank P. Strong, chief accountant of Chase Brass & Copper Co, has been elected assistant treasurer of the Kennecott Copper Corp subsidiary.

Babcock & Wilcox Co's Tubular Products Division has appointed **Millard A. Hammond** manager of Welding fittings sales.

New vice president of Gar Wood Industries, Inc, is **Joseph R. Hager, Jr,** director of manufacturing.

Appointment of **Thomas H. Marsh** as advertising manager has been announced by Simplex Wire & Cable Co. He replaces the late **E. J. MacKenzie** . . . **Willis J. Stillwell** has been named commercial development manager of the electrical products group by Minnesota Mining & Manufacturing Co.



Immediate delivery from Anaconda

Aluminum Wire and Cable—in stock and ready to go

Complete stocks of popular sizes of ACSR, service drop cables and line wire maintained at our mills for quick delivery where—and *when*—you want it: For aluminum — look to Anaconda!

1. Broadest line of aluminum conductors in the industry including bare aluminum and ACSR; Neoline*, Polene* and Duraline* line wire; Types SE, SD, N-SD and K service cables; aerial power cable; network cable; and many others.

2. Multi-mill service. Anaconda has more mills producing aluminum wire and cable than any other manufacturer. Fabricating mills strategically located across the country assure speedy service.

3. Electrical Distributors. Anaconda Wire & Cable Company has several hundred electrical distributors located throughout the country who can expeditiously provide you with Anaconda products.

4. Reduction plant at Columbia Falls, Montana, gives Anaconda control over its aluminum production from reduction of alumina . . . to wirebar . . . to rod . . . to finished product.

5. Insulated-cable experience — in design, research, construction and quality control — helps Anaconda produce aluminum wire and cable with superior electrical and physical characteristics.

6. Technical assistance. Anaconda field engineers have worked in advisory capacity on hundreds of complex jobs. They are ready to put their experience and knowledge to work on your problem.

The Man from Anaconda will be happy to help you. Backed by the broadest line of wire and cable in the industry in both copper and aluminum, he is best qualified to help you arrive at the most practical and economical answer to your cable needs. Anaconda Wire & Cable Company, 25 Broadway, New York 4, New York.

*Reg. U. S. Pat. Off. 56305

ASK THE MAN FROM ANACONDA®
FOR ALUMINUM WIRE AND CABLE

MEETINGS CALENDAR

SEPTEMBER

American Institute of Electrical Engineers—Fifth Annual Industrial Electronics Symposium, sponsored jointly with the Institute of Radio Engineers, Hotel Manger, Cleveland, Ohio, Sept. 24-25.

Edison Electric Institute—Meter and Service Committee, Purdue University, Lafayette, Indiana, Sept. 24-26; Farm Group Committees, Belmont Plaza, N. Y., Sept. 27-28; EEI-AGA Taxation Accounting Meeting, William Penn Hotel, Pittsburgh, Pa., Sept. 27-28.

Atomic Industrial Forum, Inc—3rd Annual Forum Conference and 2nd Annual Trade Fair, Morrison Hotel and Navy Pier, Chicago, Ill., Sept. 24-28.

Pennsylvania Electric Association—49th Annual Meeting, Hotel Wm. Penn, Pittsburgh, Pa., Sept. 25-26.

Electric Companies Public Information Program—Steering Committee, Blackstone Hotel, Chicago, Ill., September 26; Workshop Conference, Blackstone Hotel, Chicago, Illinois, September 26-28.

National Association of Electrical Distributors—Annual Western Region Convention, Westward Ho Hotel, Phoenix, Ariz., Sept. 30-Oct. 3.

OCTOBER

• **Pennsylvania Electric Association**—System Planning Committee, Skytop Lodge, Skytop, Pa., Oct. 1-2; Electric Equipment Committee, Arlington Hotel, Binghamton, N. Y., Oct. 4-5; Hydraulic Power Committee, Mountain View Hotel, Greensburg, Pa., Oct. 4-5; Systems Operation Committee, Penn Alto Hotel, Altoona, Pa., Oct. 10-11; Meter Committee, Split Rock Lodge, White Haven, Pa., Oct. 18-19; Communications Committee Meeting, Fort Stanwix Hotel, Johnstown, Pa., Oct. 22-23; Relay Committee Meeting, Hotel Robert Treat, Newark, N. J., Oct. 25-26.

Edison Electric Institute—Prime Movers Committee, Radisson Hotel, Minneapolis, Minn., Oct. 1-3; Area Development Committee Meeting, Oct. 3, and Area Development Committee Workshop, Radisson Hotel, Minneapolis, Minn., Oct. 4-5; Electrical Equipment Committee, Hotel Statler, Cleveland, Ohio, Oct. 15-16; Transmission and Distribution Committee, Hotel Statler, Buffalo, N. Y., Oct. 18-19.

Illinois Institute of Technology—12th Annual National Electronics Conference, sponsored jointly by AIEE, Institute of Radio-Engineers, University of Illinois, and Northwestern University, Hotel Sherman, Chicago, Ill., Oct. 1-3.

National Electronics Conference—12th Annual Conference and Exhibition, Hotel Sherman, Chicago, Ill., Oct. 1-3.

American Institute of Electrical Engineers—Fall General Meeting, Morrison Hotel, Chicago, Ill., Oct. 1-5.

Canadian Electrical Manufacturers' Association—12th Annual Meeting, Sheraton Brock Hotel, Niagara Falls, Ontario, Canada, Oct. 3-5.

Indiana Electrical Association—Annual Convention, French Lick Springs Hotel, French Lick, Ind., Oct. 3-5.

Missouri Valley Electric Association—Sales and Rural Conference, Hotel President, Kansas City, Mo., Oct. 3-5.

Southeastern Electrical Exchange—Sales Conference, Tides Hotel & Bath Club, St. Petersburg, Fla., Oct. 3-5; Accounting Meeting, Hotel Seville, Miami, Fla., Oct. 10-11.

Standards Engineers Society—Fifth Annual Meeting, Hotel Willard, Washington, D. C., Oct. 3-5.

International Association of Electric Leagues—Sheraton-Cadillac Hotel, Detroit, Mich., Oct. 3-6.

Rocky Mountain Electrical League—Annual Fall Convention, Broadmoor Hotel, Colorado Springs, Colo., Oct. 7-10.

Interstate Power Club—Hotel Martinique, New York, Oct. 8.

• **American Society of Mechanical Engineers**—Lubrication Conference, sponsored jointly with American Society of Lubrication Engineeers, Chalfonte-Haddon Hall, Atlantic City, N. J., Oct. 8-10.

Great Lakes Power Club—Fall Meeting, Durant Hotel, Flint, Michigan, Oct. 11-12.

Inter-Industry Farm Electric Utilization Council — National Power Use Workshop, Milwaukee Auditorium, Milwaukee, Wis., Oct. 15-16.

Iowa Utilities Association — Annual Management Conference, Hotel Fort Des Moines, Des Moines, Iowa, Oct. 15-16.

• **Michigan Municipal Utilities Association**—Park Place Hotel, Traverse City, Mich., Oct. 17-19.

American Institute of Electrical Engineers—Electrification of Machine Tools Conference, Sheraton-Gibson Hotel, Cincinnati, Ohio, Oct. 22-24.

American Standards Association—38th Annual Meeting and 7th National Conference on Standards, Hotel Roosevelt, New York, Oct. 22-24.

University of Texas—Ninth Power Distribution Conference, University Batts Auditorium, Austin, Tex., Oct. 22-24.

National Safety Council—44th National Safety Congress & Exposition, Chicago, Illinois, Oct. 22-26.

National Association of Corrosion Engineers—South Central Region Meeting, M & M Building, Houston, Texas, October 23-26.

Northwest Public Power Association—Power Use Section, Franklin PUD Auditorium, Pasco, Wash., Oct. 25-26.

Montana State Rural Electric Cooperative Association—Annual Meeting, Lewiston, Mont., Oct. 29-31.

NOVEMBER

National Rural Electrification Cooperative—Region Nine Annual Meeting, Davenport Hotel, Spokane, Wash., Nov. 12-13.

National Electrical Manufacturers Association—Annual Meeting, Traymore Hotel, Atlantic City, New Jersey, Nov. 12-16.

Edison Electric Institute—Industrial Relations Committee, EEI Headquarters, New York, N. Y., Nov. 15; Accident Prevention Committee, Statler Hotel, Hartford, Connecticut, November 26-28.

• **American Society of Refrigerating Engineers** — 43rd Semi-annual meeting, Hotel Statler, Boston, Mass., Nov. 25-28.

American Society of Mechanical Engineers—22nd National Exposition of Power and Mechanical Engineering, Coliseum, New York, N. Y., Nov. 25-30.

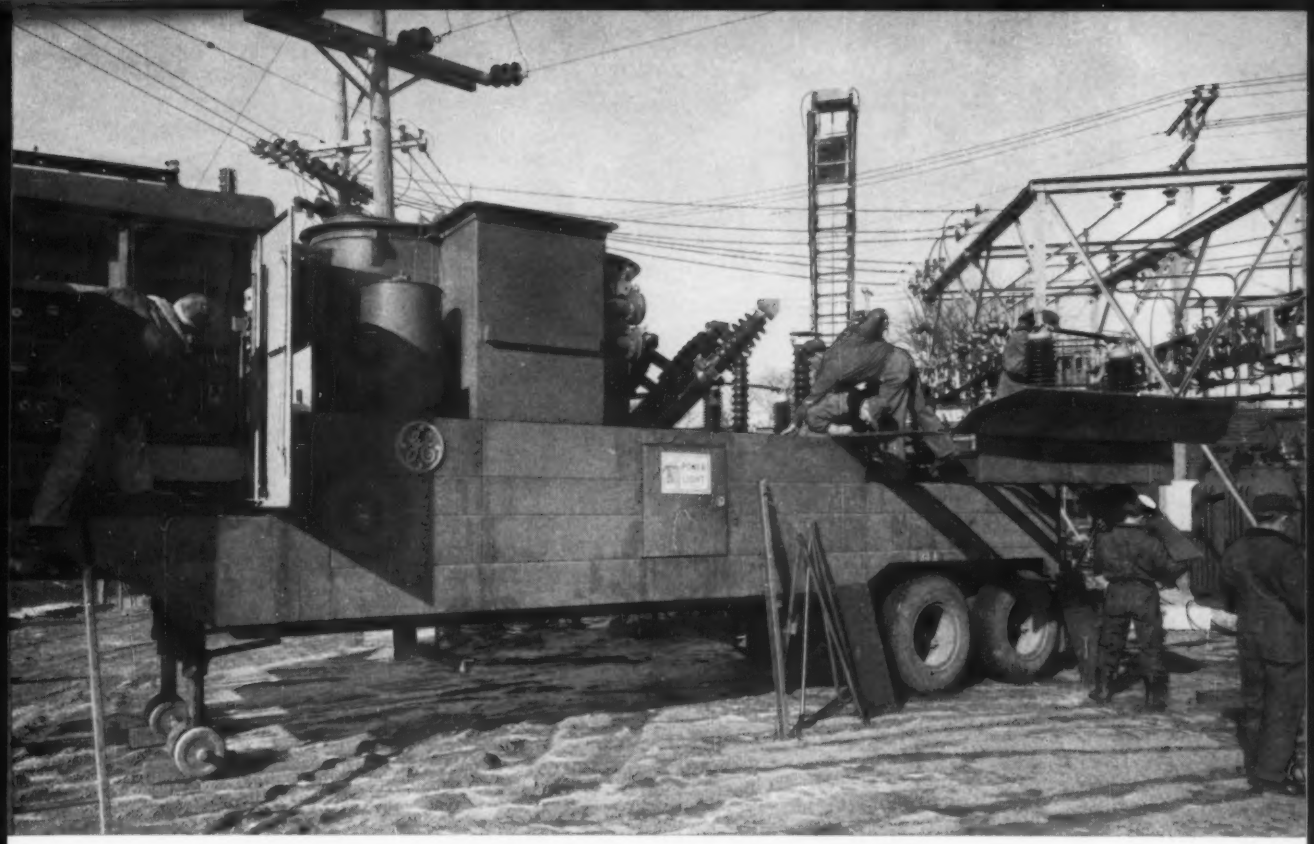
Great Lakes Conference of Railroad and Utilities Commissioners—First Annual Convention, Greenbrier Hotel, White Sulphur Springs, W. Va., Nov. 29-30.

DECEMBER

Institute of Radio Engineers—2nd Instrumentation Conference, Biltmore Hotel, Atlanta, Ga., Dec. 5-7.

Edison Electric Institute-American Gas Association—1957 Conference Planning Committee, EEI-AGA Headquarters, New York, N. Y., Dec. 6-7.

• Additions this week



GENERAL ELECTRIC Mobile Unit Substation

PAYS FOR ITSELF by reducing routine system maintenance expense

"We certainly feel that this unit is paying for itself during routine maintenance. Variations in voltage make it adaptable in many locations for a variety of jobs." This statement by Mr. Anthony Zanskas, Assistant Superintendent of Substation Construction and Maintenance, Wisconsin Power and Light, expresses the findings of many progressive utilities.

"Labor and material savings, by using the mobile unit substation for by-passing entire small substations for maintenance and transformer changes have been great, as we have been able to do this work on de-energized busses and equipment with a minimum amount of material and preparation and without any delay or outages." This additional endorsement by Mr. Carl Takle, Wisconsin P & L's Superintendent of Substation Construction and Maintenance, further demonstrates how General Electric mobile unit substations are paying off as a versatile, economical means of speeding routine system maintenance, in addition to their value as stand-by or emergency equipment.

General Electric mobile unit substations are designed for maximum versatility, with provision for various voltage combinations, if required, to meet all application needs. Each substation is a complete, fully coordinated unit, mounted on a high-speed trailer, designed for normal highway operation. For further information, contact your local G-E Apparatus Sales Office or write for bulletin GEA-4415 to General Electric Co., Schenectady 5, N. Y. 422-26

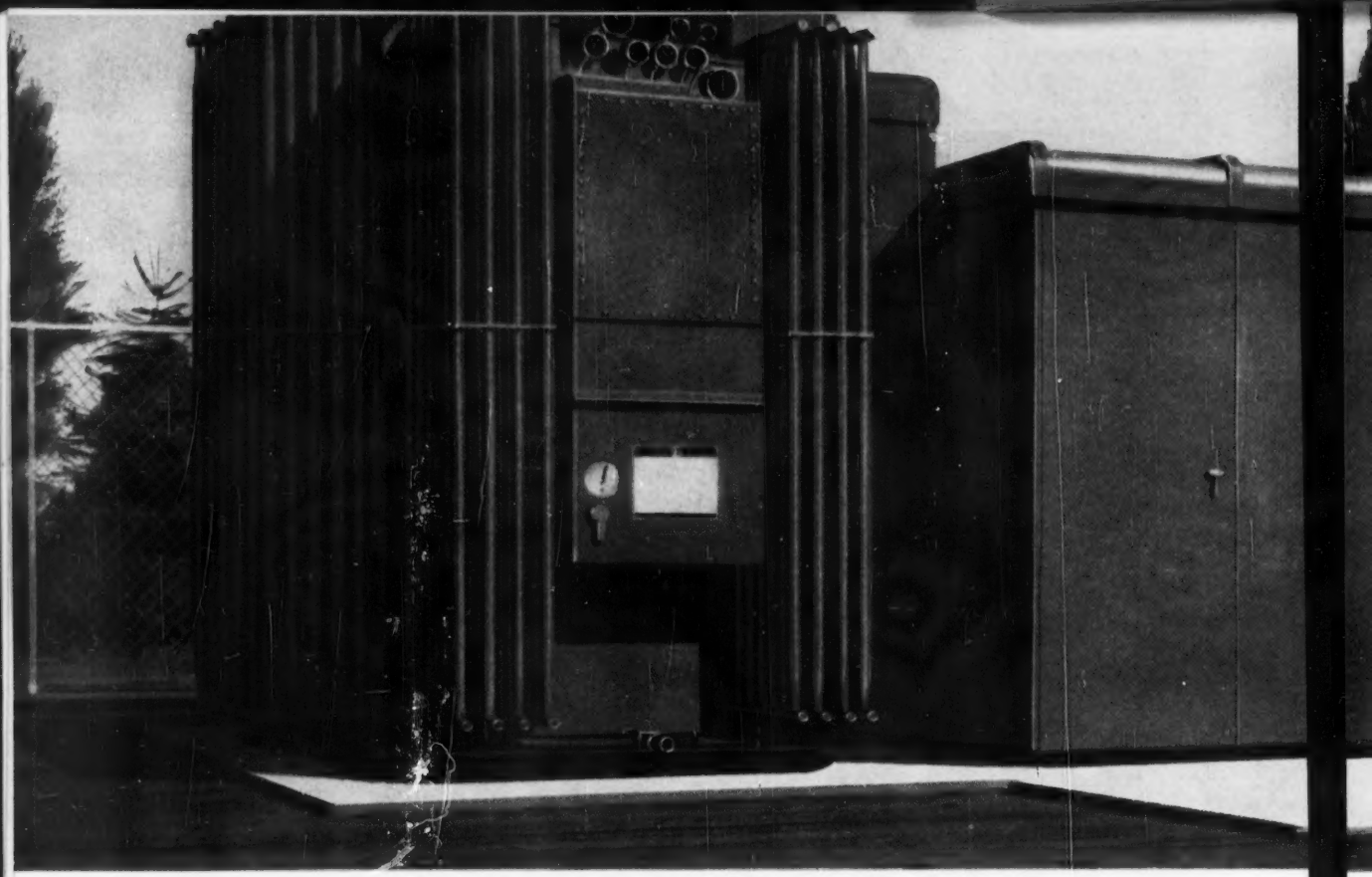
Typical six-months' operating log for Wisconsin P & L's 5000-kva G-E Mobile Unit illustrates high utilization factor. All these stops were for routine maintenance.

Location	Installed	Removed	Days	Mileage
Oregon	2–22–55	3– 6–55	13	25
Tomah	3–10–55	3–16–55	7	110
Prairie Du Chien	3–18–55	3–18–55	1	94
Baraboo	4–19–55	4–23–55	5	98
Fox Lake	5– 7–55	5–18–55	12	35
Janesville	6– 7–55	6–29–55	23	82
Mauston	7–12–55	7–19–55	8	100
Dorset	7–21–55	7–22–55	2	10
Darien	8–11–55	8–11–55	1	120
Portage	8–19–55	8–20–55	2	90
Evansville	8–23–55	8–23–55	1	45

SIX-MONTH TOTALS: 11 Locations
75 Days in Service—809 Miles Traveled

Progress Is Our Most Important Product

GENERAL ELECTRIC

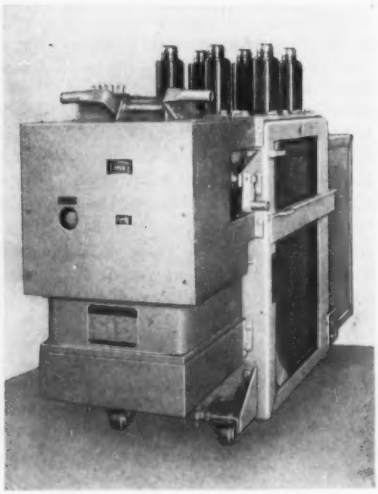


These new features provide . . .

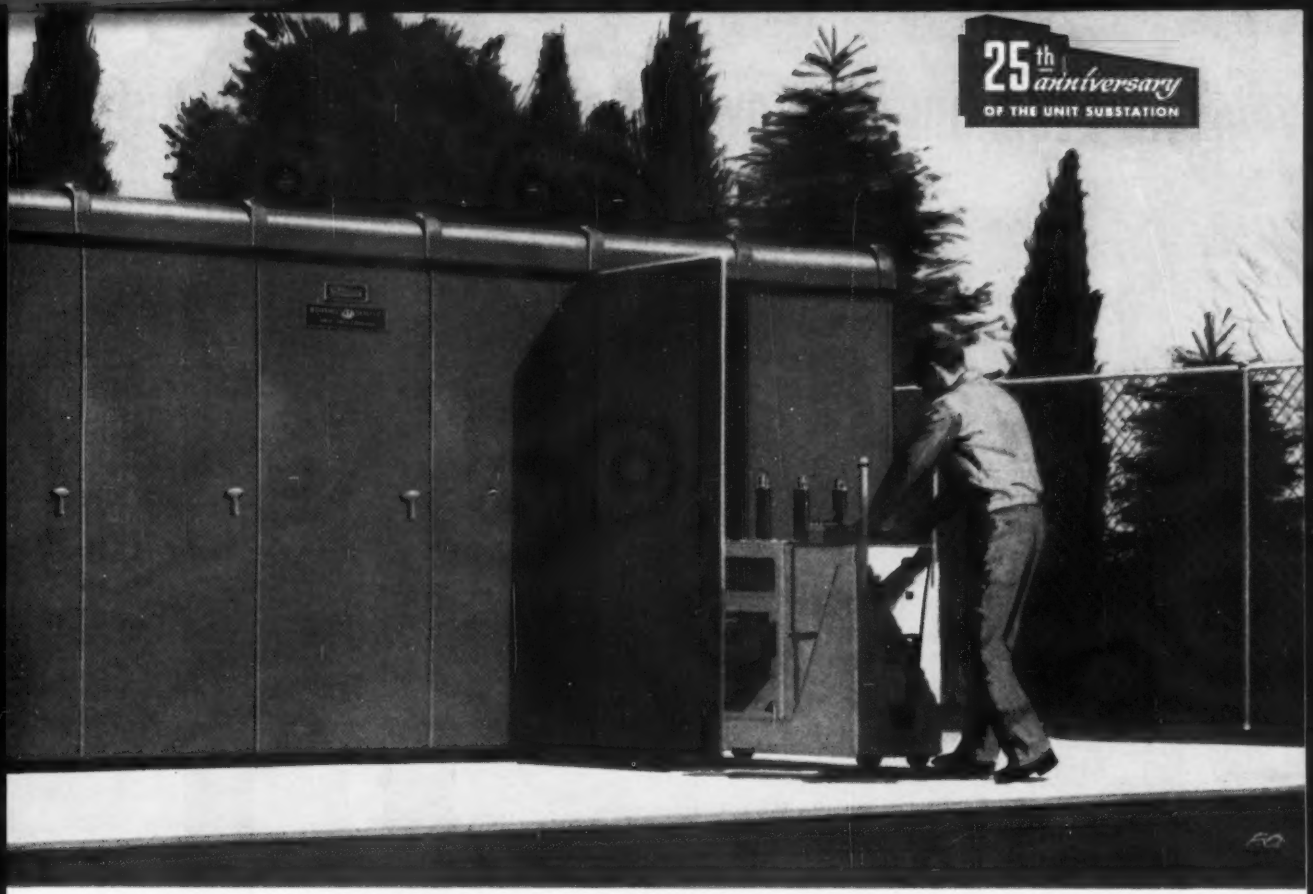
Maximum operating economy with

NEW LOAD TAP CHANGER doubles predictable life of contact tips, cutting routine maintenance in half. Peak operating noise has been reduced by 20 db.

"CONTROL CENTER" groups all transformer indicators and most accessories in single control zone—makes them easier to read and service.

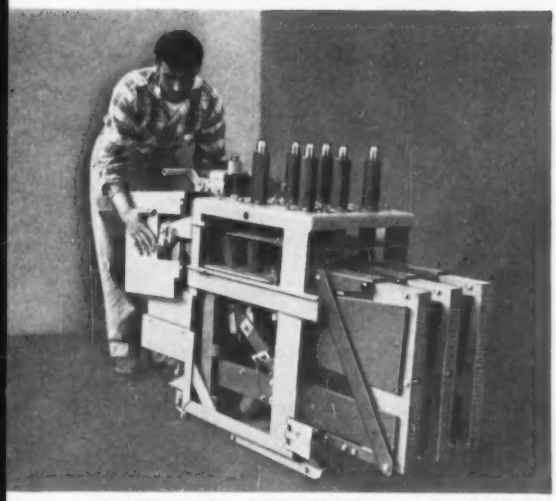


MAGNE-BLAST CIRCUIT BREAKER, now available in ratings up to 750 mva, offers maximum fire protection because of newly improved Self-X insulation.



SMALL SIZE, UNCLUTTERED APPEARANCE MAKES G-E UNIT SUBSTATION EASY TO LANDSCAPE, EASY TO INSTALL CLOSE TO LOAD.

General Electric Unit Substations



QUICK, EASY ACCESSIBILITY greatly facilitates breaker maintenance. Box barriers and operating mechanism cover can be removed in a minute and a half, completely exposing breaker's vital parts.

The features illustrated on these pages are the most recent quality improvements General Electric has built into its unit substations. They constitute a part of General Electric's continuing effort to provide the users of G-E unit substations with maximum operating performance and a minimum of maintenance. Because of this constant search for a better way, more and more utilities are installing G-E unit substations on their distribution lines as an economical means of handling rapid residential load growth.

For more information about G-E unit substations, contact your G-E Apparatus Sales Office, or write for bulletin GEA-3800, to Section 512-13, General Electric Co., Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Two Premium 75°C. Power Cables...and Both Cut

JOB COSTS

ROEBLING ROEPRENE TYPE RHW, STYLE RR, 75° C. POWER CABLE drastically slashes job costs when overloaded circuits in wet locations must be rewired. With RHW cable, you can increase current carrying capacity 18% to 50%, depending on ambient temperature, without increasing conductor size. This means there's no need to rip out and install new conduits to accommodate larger cable. Important savings in time, money and inconvenience are realized.

This versatile 600 volt cable*, suitable for operation at 75° C. in both wet and dry locations, is designed for service in underground ducts or above ground in conduits. Its insulation is specially compounded for superior aging and moisture resistant characteristics. The Roeprene sheath resists acids, most oils, moisture, flame and abrasion.

ROEBLING ROEPRENE TYPE USE, STYLE RR, 75° C. CABLE, with its new, higher temperature rating for wet locations, transmits more current through smaller size cable, thereby reducing installation costs.

Made for 600 volt service, it can be used in both wet and dry locations at 75° C. Roebling RHW insulation resists heat and moisture. Since the tough Roeprene outer sheath effectively withstands detrimental soil conditions, this cable is ideal for direct burial installations. As such, it provides a simple and direct connection from service pole to meter.

Both Roebling Type RHW and Type USE 75° C. power cables are available in single and multiple conductor construction, sizes 12 AWG to 2000 MCM. Size 14 AWG may be obtained for special applications. Write for full data, and order these cables from your distributor.

ROEBLING ELECTRICAL WIRES AND CABLES ARE AVAILABLE WITH EITHER COPPER OR ALUMINUM CONDUCTORS

*Also available as a building wire with cotton braid over RHW insulation.

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

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Today's Turbine-Generator Ratings

Machine rating depends on steam temperature and pressure, exhaust vacuum, extraction, and feedwater makeup

C. J. BALDWIN, Electric Utility Engineer, Westinghouse Electric Corp, East Pittsburgh, Pa.

"Maximum guaranteed turbine capability" has come to mean kw output at the generator terminals that the turbine is capable of producing continuously at:

1. Rated throttle (and reheat) temperature.
2. Rated throttle pressure.
3. Exhaust pressure, 3.5 in. mercury absolute.
4. Full extraction from all extraction openings.
5. 3% makeup feedwater into the cycle.

Obviously maximum guaranteed capability does not indicate maximum turbine output under operating conditions more favorable than standard. Less than full extraction, less than 3% makeup, or more favorable exhaust pressure can raise turbine output a few percent.

Not too many years ago turbines used with conventional air-cooled generators had two ratings on their nameplates: maximum guaranteed capability and nominal capability. Maximum guaranteed capability was a standard 125% of nominal rating. For example, a turbine might have been rated 80 Mw nominal and 100 Mw maximum guaranteed. The nominal rating matched the generator's kw output at 0.8 power factor while the maximum guaranteed rating matched kw output at unity. Thus the generator would have been rated 80 Mw, 0.8 pf, 100 Mva. Generator reactances in per cent were calculated on a 100-Mva base, and a commonly accepted short-circuit ratio (SCR) was 0.9. The overall turbine-generator combination was referred to as an 80-Mw unit.

With the advent of hydrogen cooling this same rating procedure was followed for a machine operating at 0.5 psig hydrogen. Thus the nominal 80-Mw turbine drove an 80-Mw, 0.8-pf, 100-Mva, 0.9-SCR generator operating at 0.5 psig hydrogen. But hydrogen cooling presented the possibility of securing additional capacity from a generator simply by increasing hydrogen pressure for additional cooling.

Fig 1 shows the increase in generator capability for increased hydrogen pressure. 30 psig permitted a 25% increase in generator loading. In other words, this hydrogen pressure permitted the generator to carry maximum guaranteed turbine capability at its rated 0.8 pf rather than unity as before. Additional load-carrying ability was secured for lower first cost.

Reduction of generator short-circuit ratio has long

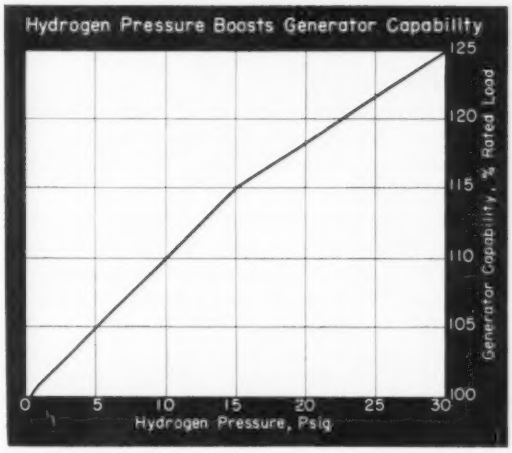


FIG. 1

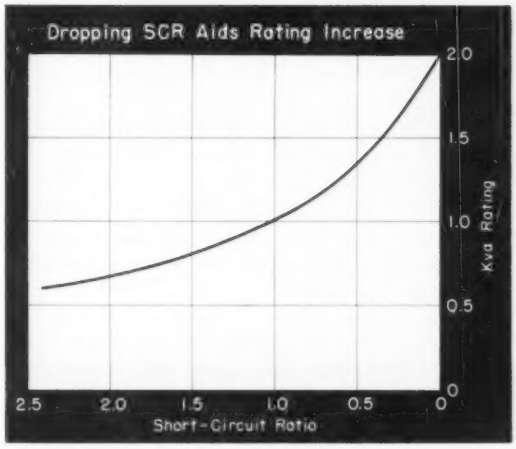


FIG. 2

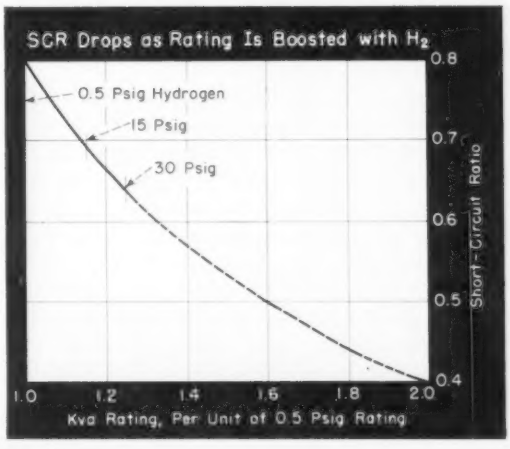


FIG. 3

held promise as another factor reducing first cost of turbine-generator units. Fig 2 shows the increase in kva rating possible with reduction of SCR for various machines of optimum design all rated at the same gas pressure. It assumes a machine of given rotor diameter and given field magnetomotive force but with variable air gap and SCR.

Generator SCR is defined as the ratio of field current producing rated no-load voltage at rated speed to the field current required to circulate rated stator current during a terminal short circuit at rated speed. But SCR is more important as a measure of the physical size of a generator and its inherent ability to operate with stability on a power system. For years there has been a gradual reduction in the SCR acceptable to operating utilities. Where 1.0 or 0.9 was formerly required, SCR of 0.8 at 0.5 psig hydrogen is now acceptable.

Standards Clarify Generator SCR

Base kva must be specified with SCR because the SCR of a generator of a given physical size naturally goes down as its base kva goes up. Thus the same machine will have 0.8 SCR on a base kva at 0.5 psig, 0.69 SCR on a base kva at 15 psig, and 0.64 SCR on a base kva at 30 psig. This is illustrated in Fig 3 for a single machine with varying gas pressure.

Likewise the base kva must be specified when generator reactances are given in per cent or per unit. For example, transient reactance of a generator might be given either as 20% on the base kva at 0.5 psig hydrogen or 25% on the base kva at 30 psig hydrogen. But to simply give transient reactance as 20% is inadequate.

The next development in rating practice was by an AIEE-ASME joint committee which standardized generator SCR and power factor at 0.8 and 0.85, respectively, at 0.5 psig hydrogen. These values were selected because of the acceptance of physically smaller machines on systems and the trend toward operation at higher system power factor. Although all unit sizes were not standardized at the same time, the effect of this action on turbine-generator ratings can be demonstrated by reference to the nominal 80-Mw unit described above.

The old 80-Mw generator rated at 0.8 pf and 0.9 SCR at 0.5 psig hydrogen was observed to have the same dimensions as a machine rated 91 Mw at 0.85 pf and 0.8 SCR at 0.5 psig. Physically the same turbine could drive both. Therefore no change was made in the turbine coupled to this newly rated machine except that it was called a "90-Mw" turbine instead of 80-Mw. Its maximum guaranteed capability was still 100 Mw, now approximately 10% above the nominal rating instead of 25%. The turbine maximum guaranteed capability became a standard 110% of nominal rating.

This was the AIEE-ASME standard machine. A turbine of nominal 90-Mw rating and 100-Mw maximum guaranteed capability would drive a generator rated 106,951 kva, 0.85 pf, and 0.8 SCR at 0.5 psig hydrogen.

The next step was to omit all reference to nominal rating of the turbine. Thus the above machine was designated a 100-Mw unit and only the maximum guaranteed capability appeared on the turbine nameplate. All double-rating teminology was eliminated for turbines, but generator capability appeared on nameplates for 0.5 psig, 15 psig, and 30 psig.

Recent Units Carry Single Rating

More recently conventional generators have come to be rated only at a base hydrogen pressure of 30 psig. A single maximum guaranteed capability appears on the turbine nameplate and a single kva capability on the generator nameplate. To match properly turbine and generator ratings with current practices, the relationship between maximum guaranteed capability and generator kva at 30 psig is needed.

Referring again to the 100-Mw unit and allowing 1% gain in generator capability per pound increase in hydrogen pressure up to 5 psig, the 91-Mw generator matches the 100-Mw turbine at 10 psig. The generator rating at 30 psig then is 1.25/1.10 times its rating at 10 psig. If this ratio is divided by 0.85 rated pf, generator kva results. Thus, for an AIEE-ASME standard machine, generator kva at 30 psig is 1.33689 times turbine nameplate.

For the so-called "handbook" generators of prestandard design, less kva capacity is provided in proportion to turbine capability than in preferred standard designs. Handbook-generator rated capability matches turbine maximum guaranteed capability at 15 psig instead of 10 psig. At 30 psig generator kw is 1.25/1.15 times turbine maximum guaranteed capability. Dividing this ratio by 0.85 pf gives a generator kva of 1.28 times the turbine nameplate. For example, a handbook unit with a 100-Mw turbine would have a 128-Mva generator rated at 0.85 pf, 0.64 SCR, 30 psig.

Innercooled machines are rated exactly the same as conventional machines, except the rating is at 45 psig hydrogen instead of 30 psig. Thus their generator kva at 45 psig is equal to 1.28 or 1.33689 times turbine maximum guaranteed capability.

Relationship of Turbine and Generator Ratings

Machine	Generator Kva / Turbine Max. Guar. Kw
AIEE-ASME Standard (30 psig)	1.33689
Handbook (30 psig)	1.28
Intercooled (45 psig)	1.28 or 1.33689

Mr. C. J. Cox (at right, above) supervises the installation of Okonite Splicing Tape on 2300 volt motor lead in Seabrook Farms food freezing plant. For 29 years Mr. Cox has standardized on Okonite splicing materials to assure water-tight seals on cables throughout the plant. Note moisture conditions indicated by frozen condensation on pump head.

Okonite Tapes resist moisture, freezing...

keep world's largest food freezing plant operating

For 29 years, Mr. C. J. Cox, supervisor of all construction and engineering for Seabrook Farms Co., has depended on Okonite Tapes to maintain the vast electrical network that keeps the world's largest food freezing plant operating. All electrical circuits (totaling 20,000 h.p. connected load), lights, as well as power for the motors and pumps which provide continuous freezing and storage capacity, are spliced and terminated with waterproof Okonite Tapes to assure positive protection against the moisture always present in the plant.

In every phase of Seabrook's operation, moisture is a problem. Treatment of food, freezing, processing, storing . . . all are damp operations with continuous condensation on cables and equipment alike. Low temperatures of the freezing and holding rooms make splicing difficult.

Okonite Tapes offer effective waterproof splices that are not affected by dampness or low temperatures. Both Okonite Rubber Tape and Okolite High Voltage Tape fuse into a solid self-vulcanizing wall of tough, waterproof insulation. Protected by Manson Friction Tape, splices maintain their moisture resistance through many years of exposure to condensation and freezing temperatures.

Specify Okonite tapes for the tougher jobs. Get them from your Okonite Tape Distributor, or write to The Okonite Company, EW Tape Department, Passaic, New Jersey.

Available through authorized distributors only

OKONITE

splicing materials

3521-A

Underground Plant Ups Mexico's Kw

GENERATION—Design

Latest hydro plant on Miguel Aleman System will feature underground powerhouse and 1,127-ft vertical penstock

The $20 million, 150-Mw hydroelectric power project of Tingambato, fifth of six generating stations of Mexico's Miguel Aleman System, is nearing completion. Being built for the Comision Federal de Electrididad, the Aleman System is the government's strongest ally in a race to help the two major foreign private power companies keep pace with Mexico's soaring power demand.

The system drains a 1,300-sq mile mountainous region in southern central Mexico. It consists of a series of dams and waterways through which water beginning 8,600 ft above sea level flows through penstocks of five power plants. The lowest is Tingambato at 2,264 ft above sea level.

Already four generating plants are in operation. These are San Bartolo No. 1 (25,200 kw), El Durazno (18,000 kw), Ixtapantongo (106,000 kw), and Santa Barbara (67,575 Kw). When Tingambato adds its 150,000 kw, the system will be producing 366,775 kw. Planned, but not yet started, is a sixth generating plant, the 18,000-kw San Bartolo No. 2.

Tingambato, the largest station, is located 120 miles west and slightly south of Mexico City. This project includes two tunnels driven 9 miles through mountains, a 1,127-ft vertical penstock, and an underground powerhouse, all carved out of granite.

The Tingambato project begins with the Santo Tomas Dam which will have a working capacity of 22.6 million gal of water. The dam will serve as a waterflow regulator and principal supply-source, controlling the course of Rio Ixtapan del Oro. This river will merge with Rio Tilostoc at the foot of the basin to be formed by the Santo Tomas Dam. The dam, of the rock-fill impermeable center type, is 171 ft high, 20 ft wide at its crest, and 502 ft long. Its outlet is located 61 ft below the crest, and at this level Tunnel No. 1 begins.

This is 6.3 miles long with an 11.8-ft inside diam. About the first 9,000 ft were blasted through alternating strata of columnar basalt, brecciated basalt, and metamorphic shale. Then the drillers moved into firm granite.

This tunnel discharges into the regulating basin

of Pinzanes which has a working capacity of 12 million gal. Pinzanes is 200 ft high, 16.5 ft wide at its crest, and 846 ft long. The second tunnel begins 69 ft below the crest.

This is 2.7 miles long with a 12-ft inside dia. The firm granite encountered in Tunnel No. 1 continued throughout this second conduit. Both are lined with a minimum of 6-in. of concrete.

A series of wells and oscillating galleries form the surge tank system. They are located about 100 ft inside the mouth of Tunnel No. 2. The valve house is a few feet in front of the outlet of Tunnel No. 2.

By means of a 90-deg elbow the water then flows into the steel pressure tube which in welded sections lines the longest vertical penstock in Mexico. Waters from five rivers will plunge 1,127 ft and build static water pressure of 488 psi to spin three turbines in the underground powerhouse hollowed out of the same mountain.

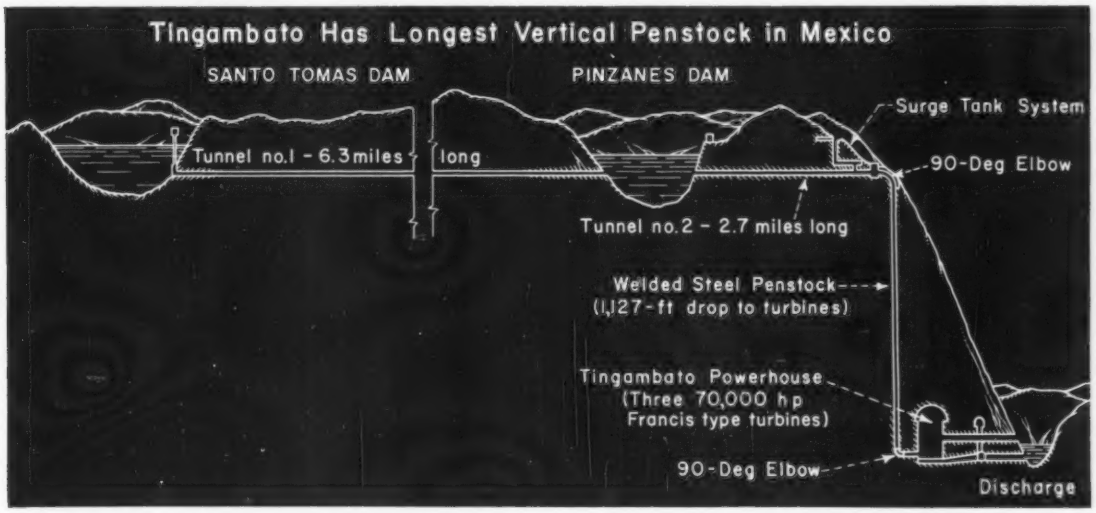
This powerhouse is 207 ft long, 114 ft high, and 39 ft wide. The walls are shored up with steel-reinforced concrete further strengthened by frequent insertion of 15-ft lengths of steel pipe.

Water plunging to the turbine-level will be channeled by another 90-deg elbow into three branches leading to the 600-rpm turbine wheels. Turbines are of the vertical, Francis type, each with 70,000 hp capacity. Generators are rated 50,000 kva each. The first unit is to begin operation in December, the remaining two by the end of 1957.

All energy produced by the Miguel Aleman System is sold to Mexican Power & Light Co, owned largely by private foreign capital. Mexlight distributes this energy, along with some 500,000 kw of its own production, to the Federal District and neighboring areas of six surrounding states.

PART OF PENSTOCK'S three-sectioned top elbow is readied for hoist. Construction camp is located 1,200 ft below

CONSTRUCTION IS nearly finished on Tunnel No. 2 at Pinzanes Dam. Tunnel will begin 69 ft below the crest of dam



NINE MILES OF tunnel carry water from Santo Tomas Dam to Tingambato powerhouse. Tunnels are lined with concrete. Vertical welded steel penstock is 1,127 ft in length and it is subjected to a static water pressure of 488 psi

Living the good life—

up on a utility pole

WE'D LIKE to alter that headline just a little. It should read: Living the good *long* life – up on a utility pole . . . since that's the aim of our product.

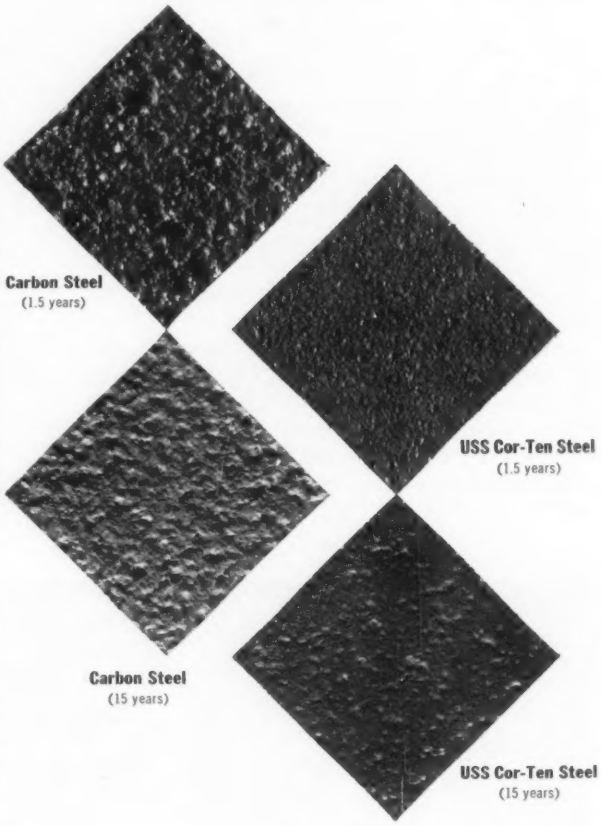
Engineers, design specialists and corrosion experts have devoted countless hours—and dollars—to the development of pole line hardware capable of matching the life of a treated pole. The nudge of necessity in this search being the ever-increasing costs of replacing hardware.

Twenty-three years ago, United States Steel first marketed a high-strength, low-alloy steel under the trade name of USS COR-TEN. It was developed specifically for applications requiring greater resistance to atmospheric corrosion and a higher yield point than was offered by regular carbon steel. Today, nearly 2,000,000 tons of USS COR-TEN Steel are out-performing carbon steel on hundreds of jobs all over the world. In short, the product has been proven. More and more cost-conscious utility companies are specifying that their pole line hardware be made from USS COR-TEN High Strength Steel.

Speaking of proof, let's look at two samples . . . one of carbon steel, the other of USS COR-TEN Steel, both uncoated. The samples were photographed after a year-and-a-half exposure in industrial atmosphere. Notice how much coarser the oxide film is on the carbon steel. This allows absorption of corrosion-inducing moisture. The sample of USS COR-TEN Steel has a far smoother, more tightly adhering film of oxide. This tight film acts as a barrier, holding moisture *away* from the steel, permitting it to evaporate—thus retarding corrosion.

Whoooosh! Fifteen years whiz by and our samples are still sitting it out in the same atmosphere. Again the camera shutter is flipped. Now we find the carbon steel well along in its tendency to revert to its original state, ferric oxide. The loss of weight by actual measurement is *over four times* that of the USS COR-TEN Steel sample. Probably a more graphic way to describe this test would be to say that if these two samples—in the form of hardware —had been on your utility poles, you would be replacing the carbon steel lot while the USS COR-TEN Steel hardware would be quite obviously fit for many more years of service.

Pole line hardware made of USS COR-TEN High Strength Steel is on the market now. If you would like more information about high-strength, corrosion-resistant hardware, or would like the names of companies manufacturing it, write to United States Steel Corporation, 525 William Penn Place, Pittsburgh 30, Pennsylvania.



UNITED STATES STEEL CORPORATION, PITTSBURGH
AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA.
UNITED STATES STEEL SUPPLY DIVISION,
WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

Must Meet 2 Trillion KWHR Demand...

. . . Sporn tells Virginia utilities group. Site acquisition, fuel, expansion financing, and personnel among major problems

The electric utility industry must come to grips with the specific challenges posed by a quadrupled demand for its services during the next twenty years. This plea was made by Philip Sporn, president, American Gas & Electric Co, before the Public Utilities Association of the Virginias meeting at White Sulphur Springs, W. Va., Sept. 14-15.

Sporn was a featured speaker at the two-day meeting attended by some 400 utility executives and their wives from Virginia and West Virginia. Other speakers were Edwin Vennard, vice president and managing director, Edison Electric Institute; John A. Hutcheson, Vice President-engineering, Westinghouse Electric Corp; and Stuart T. Saunders, vice president and general counsel, Norfolk and Western Railway Co.

New president of the association is W. J. Stewart, assistant general manager, Wheeling Electric Co. H. D. Stillman, division manager, Appalachian Electric Power Co, was elected second vice president of the Association. W. F. Keehne, Applachian Electric Power Co, continues as treasurer.

Growing markets, the constant need for technological progress, and increasing competition, Sporn told the association, makes the electric utility industry "perhaps the most dynamic" among the many large U. S. industries. He sketched in a forecast of a two trillion kwhr demand by 1975. To meet this demand and fulfill the other duties and responsibilities which the industry has, Sporn said utility management must find the solutions to the following problems:

- The determination and acquisition of sites for generating, transmission, and other facilities needed for meeting power demands.
- The availability and economy of the various fuels needed to produce electric power in the quantities needed.
- The necessity of raising some $90-$100 billion for financing utility expansion over the next two decades.
- Recruitment and training of personnel, even at the expense of present earning, for manning the ever-expanding electric utilities.

Sporn also told the meeting that the industry must direct efforts toward load development, especially year-round air conditioning; atomic power development; organized research; and the private-public power controversy.

Edwin Vennard called for an intensive employee and public information program to gain fair legislative treatment for electric utilities. Discriminatory legislation will be repealed, Vennard said, when the American people want it repealed.

Dr. Hutcheson described research in the electric power field as the "leavening in the bread." Research, the search for new scientific knowledge, will make many things possible that today are impossible, Hutcheson said.

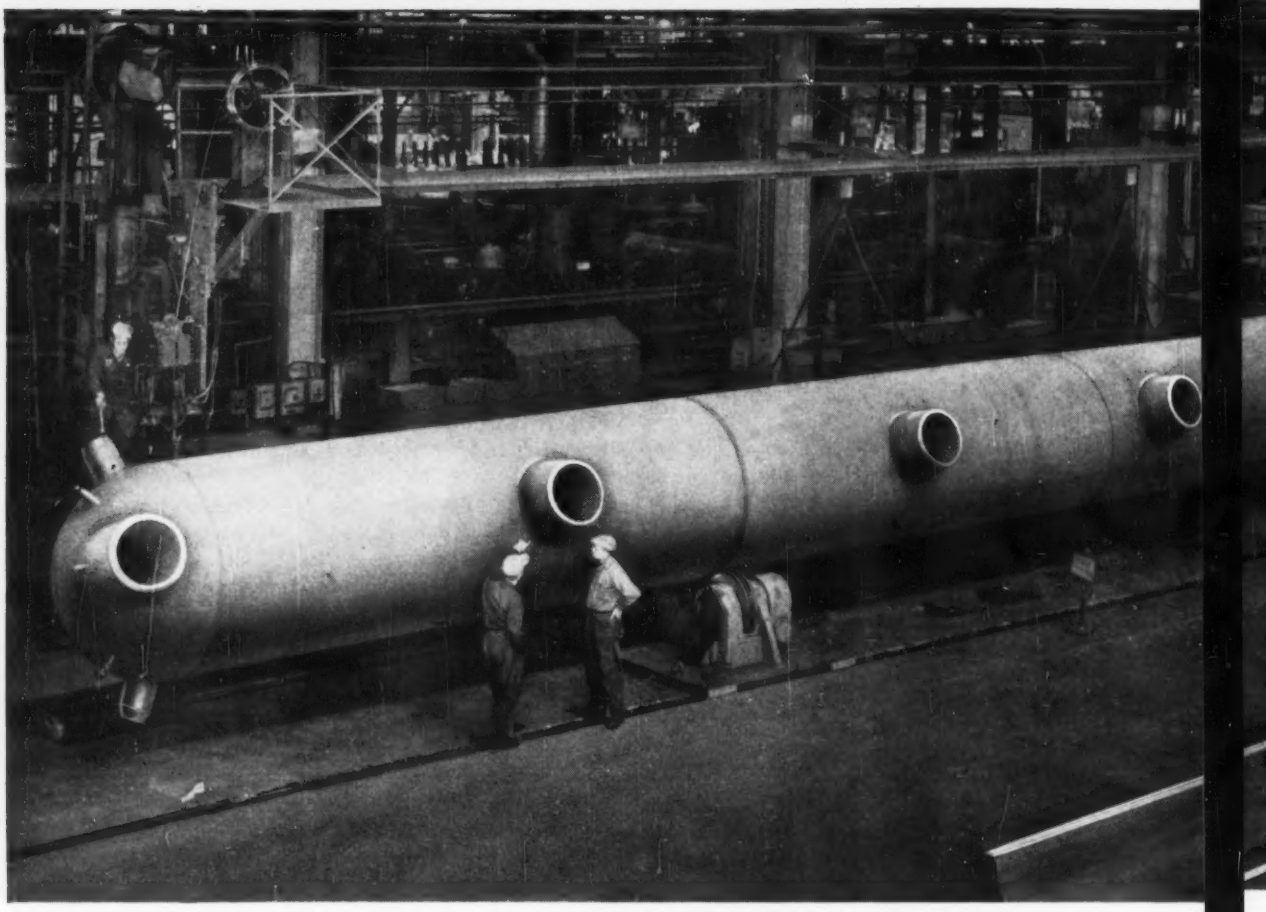
'Reddy' Quizzes Public At Wisconsin State Fair

The extent of public information on various phases of the electric industry was visually demonstrated at the recent Wisconsin State Fair where an electronically controlled and mechanically operated quiz show attracted thousands of contestants.

The huge "Reddy" quiz machine (right) tested volunteers on 141 questions covering Live Better . . . Electrically, housepower, kwhr use, cost of operating appliances, government in the electric business, tax disparities, atomic energy development, electricity costs compared to prices of other commodities, and methods of generation.

Results of the quiz, in which about 600 persons participated each day, showed that some questions, which were believed to be easily answered because of advertising and public relations efforts on national and local levels, proved too difficult for many contestants. During the first days of the quiz, only 40% scored 150 points to qualify for an award, although the maximum possible score was 300.

The exhibit, sponsored by seven electric company members of Wisconsin Utilities Association, also featured a continuous screening of the association's Electric Research Farm color-sound film.



CONSTRUCTION IN HIGH

Two of the world's largest boilers for

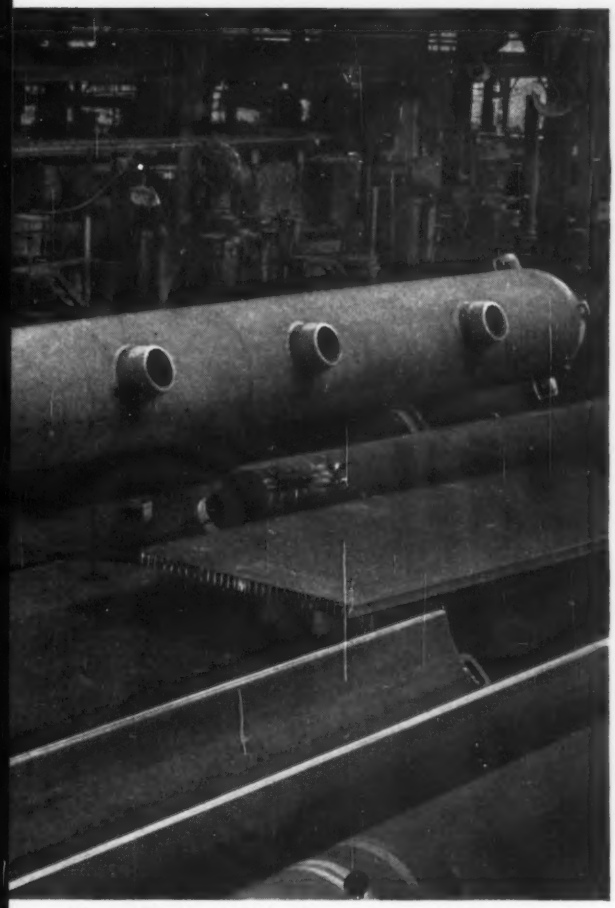
Keeping ahead of the world's greatest city is no easy task—but for many years "largests" and "firsts" have had to be the rule with New York's source of light and energy.

B&W furnished the first million pound per hour boiler for Con Edison's Hell Gate Station back in 1930. Many other engineering advances later accepted as standard in the industry have been pioneered on this system. For example, B&W furnished —for Con Edison's Astoria Station—the first pulverized-coal-fired pressurized boilers operating without induced draft fans.

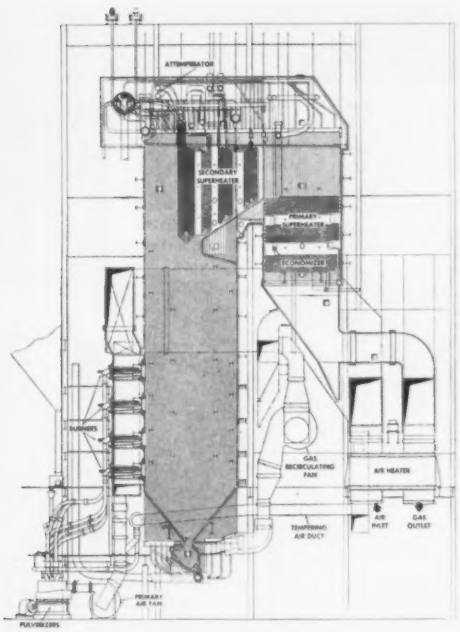
And now, this latest step: two huge B&W Radiant Boilers being built for Con Edison . . . right in line with Con Edison's long-standing policy of progressive engineering.

Each B&W Radiant Boiler has a capacity of 2,400,000 lb of steam per hr and features pressure-firing, natural circulation, and separate furnaces with a single steam drum. The unit for Astoria is the third pressure-fired B&W Boiler to be designed for this new modern station of the Con Edison System.

In all but size and design details, Con Edison's new boilers are typical of many other B&W units now providing dependable, efficient steam generation in central station and industrial plant service.



The world's largest boiler drum . . . over 100 feet long, 66 inches inside diameter . . . is shown in a finishing bay at the B&W Barberton Plant awaiting shipment to Con Edison. It weighs over 200 tons.



One of the two identical B&W units for Con Edison's Astoria and Arthur Kill Stations. It is a horizontally pressure-fired, coal-burning Radiant Boiler designed for dry ash removal. Type EL Pulverizers are used to permit reliable, efficient, direct-firing of pulverized coal. The unit has a design pressure of 2500 psi, steam temperature of 1050 F and reheat to 1000 F. The secondary superheater is located at the exit of one furnace, and the reheater at the exit of the other furnace. The primary superheater is back of both the secondary superheater and the reheater. The giant drum, with Cyclone Steam Separators for natural circulation, provides nearly 100% separation of steam from water.

GEAR AT CON EDISON

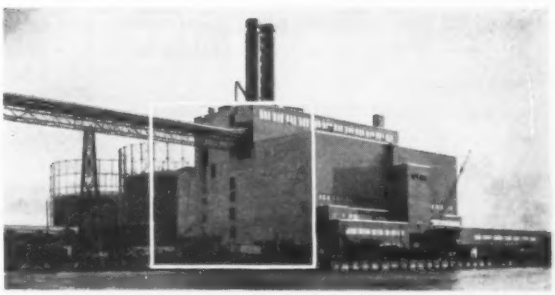
Astoria and Arthur Kill Stations

B&W engineering advances in terms of improved steam generation efficiency—under your fuel and operation conditions... are available to you. Write, The Babcock & Wilcox Company, 161 East 42nd Street, New York 17, N. Y.

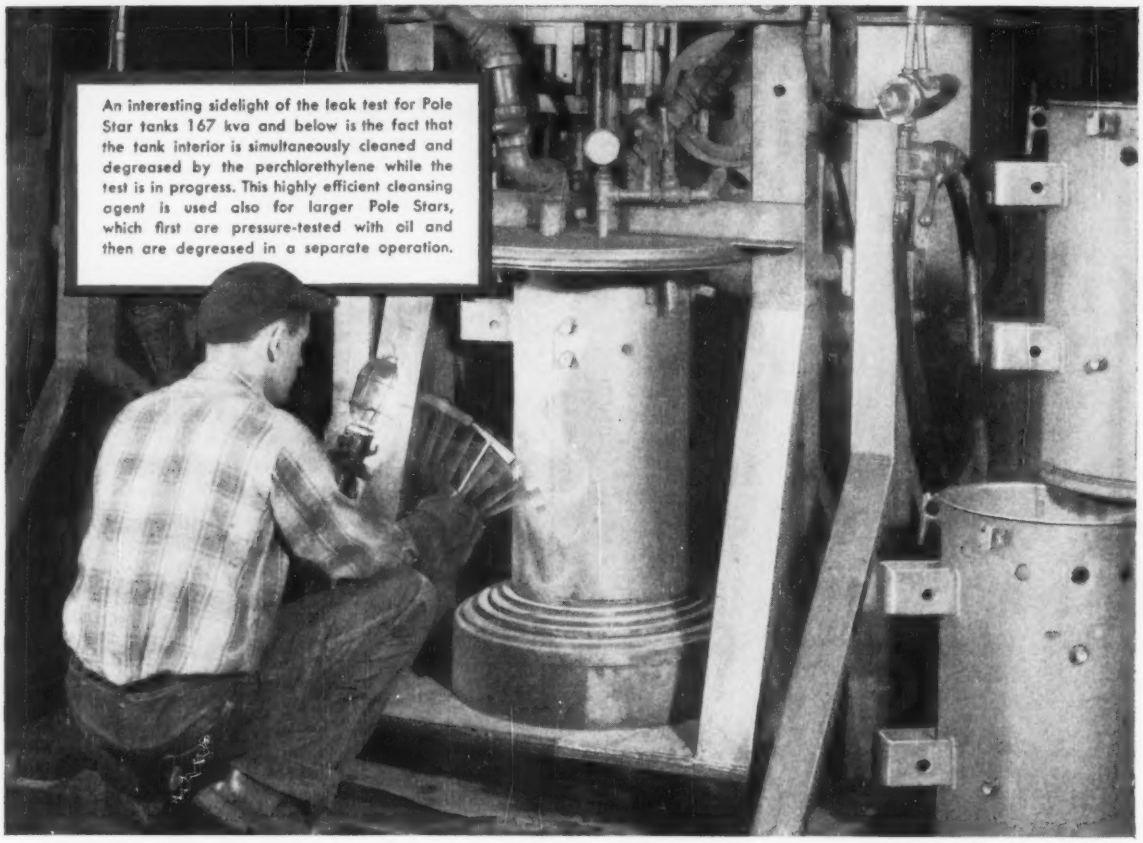
G-813-CS

BABCOCK & WILCOX

BOILER DIVISION



Area outlined in white shows construction area on third unit for Con Edison's Astoria Station.


An interesting sidelight of the leak test for Pole Star tanks 167 kva and below is the fact that the tank interior is simultaneously cleaned and degreased by the perchlorethylene while the test is in progress. This highly efficient cleansing agent is used also for larger Pole Stars, which first are pressure-tested with oil and then are degreased in a separate operation.

He's hammering all welds—under pressure—to leak-proof your POLE STAR tanks

In this age of complicated testing equipment, the "hammer" leak-detection test for Pole Star distribution transformer tanks seems almost primitive in its simplicity. Actually, it is a highly effective production-line procedure that has definite advantages over other methods of leak detection.

After all welds have been dusted with blue chalk, the tank is filled with perchlorethylene to a hydraulic pressure of 15 psi . . . then, all welded seams and joints are rapped sharply with a hammer while the workman, using a portable light to eliminate shadows, inspects the chalk areas for easily detected dark spots, which indicate leakage.

Vibrations set up by the hammer, as well as the force of the blows themselves, cause minute separations at any burned or insufficiently welded areas that might go unnoticed in tests using only internal pressure. Because of the low surface tension of perchlorethylene (it has a greater tendency to "spread" than do most liquids, including water), the liquid penetrates even microscopic openings.

When a leak is detected, the tank is returned to the welding department. After the faulty weld has been corrected, the tank must undergo complete re-inspection for possible leaks before finally being given the Pole Star stamp of approval.

167 Production Controls make Pole Star Best!

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division **CANONSBURG, PA.** *Greater Pittsburgh District*

Pole Star Transformers are available in all standard single phase distribution sizes from 3 through 500 kva, through 67,000 volts.

SALES AND SERVICE

Displays Reflect Plans for . . .

West's LBE Boom

Southern Cal Ed's allies are urged to tie in with $400,000 campaign slated through '57

As the window display photos suggest, Live Better Electrically is getting high exposure among Southern California Edison Co. customers. And, as previewed for trade allies by the company last month, LBE promises to become the most extensively plugged slogan in Southern California. Los Angeles Department of Water & Power's own LBE campaign will add to the impact.

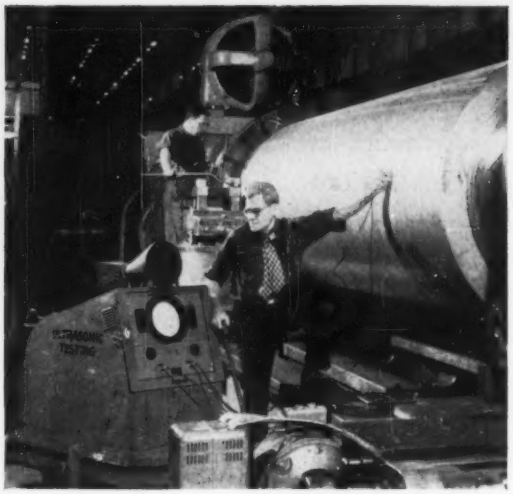
SCE's Pres Harold Quinton told representatives of Southland electric companies, manufacturers and distributors about plans for a cooperative advertising and sales promotion program at the August meeting. "We are suggesting," he said, "that whatever advertising you may be doing, you permit us to develop our pattern with you and that you consider the planning of your pattern with us. . . ." The goal: A repetitive, comprehensive LBE program.

Suggested Quinton: "Every time we place an ad of any character, whether it be in a newspaper or magazine or billboard we use the (LBE) slogan."

With a $400,000 advertising program SCE plans to run a series of four-color Sunday newspaper magazine ads in October Los Angeles papers, a series of special LBE supplements in major daily and suburban papers, added radio and billboard coverage, and revitalized consumer magazine ad schedule. The campaign will run through December 1957.

For the sales program a wide range of point-of-purchase sales aids is being introduced. Plans are also underway for creating and converting prospects into sales at dealer level. SCE's 8,000 plus employees will be asked to scout up prospects.

Now underway is a series of district meetings to acquaint dealers with the program.



GE Tests Rotors Ultrasonically

General Electric workmen are shown testing a huge generator rotor at the company's Large Steam Turbine-Generator plant in Schenectady, N. Y.

The device being used is an ultransonic tester which employs piezo-electric crystals to transmit and receive vibrations. The vibrations are sent out by the transmitter, and reflected back to the receiver by any flaw which intercepts them. Thus, any discontinuity within the rotor, and the depth at which it occurs, is indicated on the ultrasonic flaw detector.

A-C Gets Transformer, Turbine Orders

Allis-Chalmers Mfg Co has received two large equipment orders. The firm will supply two 175,000-kva, 330 to 138-kv autotransformers to the switching station near Orlando Park, Ill., of the Commonwealth Edison Co. This station terminates a new 330,000 volt line operated by the Indiana & Michigan Electric Co; thus, a tie arrangement is provided that will be beneficial to both companies for emergencies, repairs, etc.

The second order is for two Francis runner, plate steel scroll case hydraulic turbines at the Fort Peck Dam in northeastern Montana, said to be the largest earth-filled dam in the world. Each turbine is rated at 55,000 hp at 128.6 rpm under 170-ft head, to deliver not less than 63,500 hp at full gate capacity. Delivery is scheduled for 1959.

S. M. Smith Received Water-Wheel Order

S. Morgan Smith Co, York, Pa., received a contract for five hydraulic turbine units from Bechtel Corp, engineers and agent for the Pacific Power & Light Co and Cowlitz County Public Utility District. The contract for the turbines, which are to be located at Swift Creek, a tributary of the Lewis River in Washington, is valued at $3.25 million.

The three 100,000-hp, 180-rpm units for Swift Creek No. 1 will operate under a 350-ft net head. They will have 11 ft diameter spiral cases made of T-1 steel. This application of T-1 is believed to be the second such use of this new alloy for hydro project spiral cases. The first was for the Brownlee Plant on the Snake River in Idaho. Smith is presently constructing the four 144,000-hp turbines for that project.

The downstream Swift Creek Plant No. 2 will have two 46,000-hp, 128.6-rpm units operating under a 128-ft net head. The mild steel spiral cases for this plant measure 16 ft, and will be completely field welded.

Delivery dates begin in the late fall of 1957 and will run into late spring of 1958. Telemetering from the Merwin Station will provide load control for both plants. The turbines at Swift Creek No. 2 will be started and stopped from No. 1, where an inspector operator will be on duty.

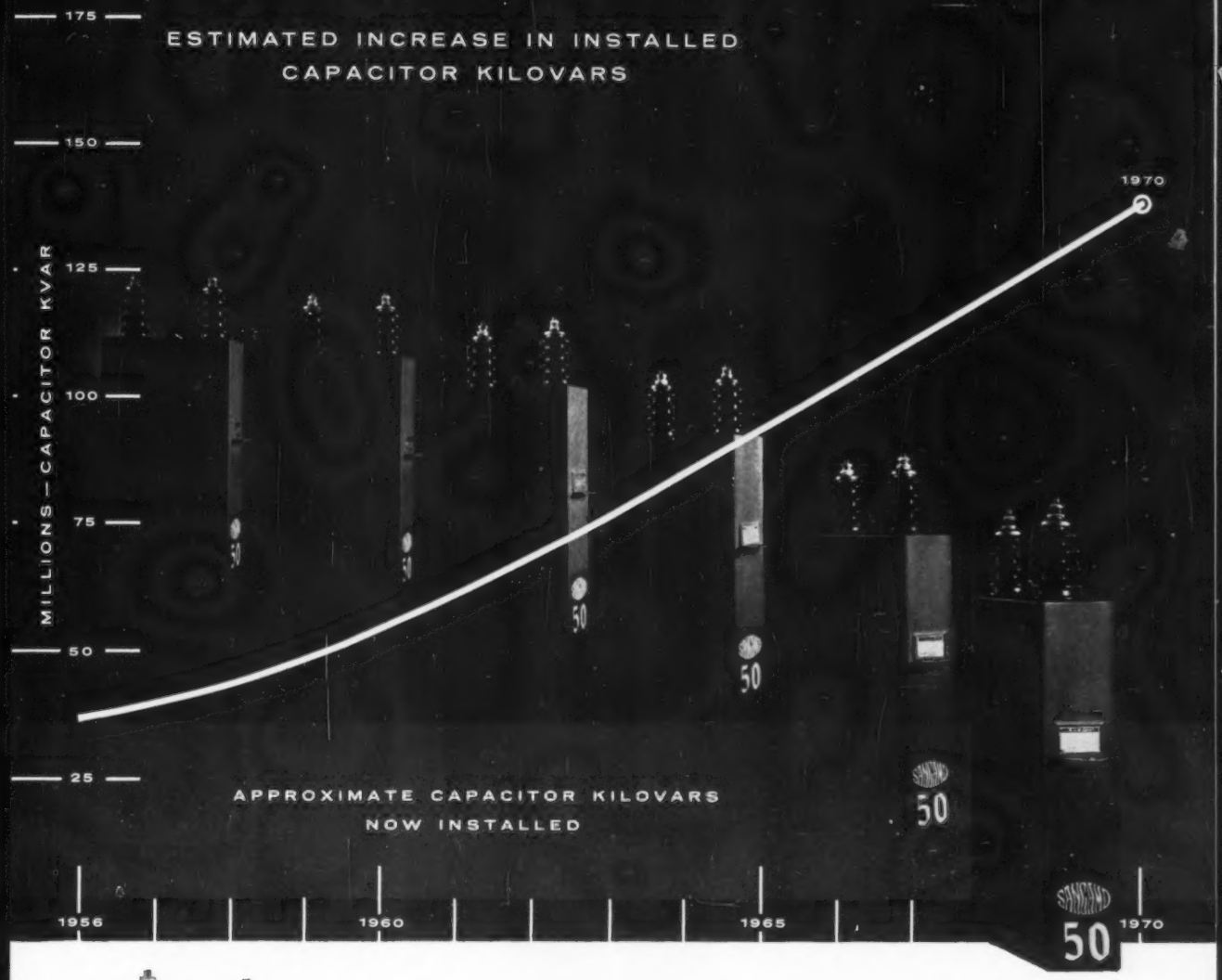
Pole, Crossarm Output Up for 1955

The number of poles produced in 1955 was 17% greater than in 1954, while crossarm production for the same period rose 16%, according to "Wood Preservation Statistics—1955". This is an annual report prepared by the Forest Service of the U. S. Dept of Agriculture in cooperation with the American Wood-Preservers Association.

The number of pressure-treated Southern pine poles produced in 1955 was approximately 4,150,000, compared to 3,631,000 in 1954; figures for pressure-treated Douglas fir poles were approximately 342,000 and 298,000, respectively. Those for Lodgepole pine poles were 167,000 and 205,000. Among the non pressure-treated poles, Western red cedar ranked highest with approximately 355,000 in 1955, and 417,000 in 1954.

Southern pine pressure-treated crossarms num-

(*Continued on page* 59)



PC56-5

Plan low-cost kvar supply with Sangamo Capacitors

The tremendous growth facing the electric utility industry, and associated economic considerations, point up the need for near unity power factor operation at peak load. Your growing requirements for Kvar supply can be met adequately and economically with Sangamo Power Capacitors.

These capacitors are designed to the specifications of power engineers throughout the country. They are built in a brand new "controlled conditions" plant—under exacting Sangamo quality control through every step of the manufacturing process. They are thoroughly tested to help make sure that their service life is long and troublefree.

Sangamo Diaclor Power Capacitors are available in 25 or 50 Kvar ratings—of identical width and thickness—as individual units or in factory-assembled and wired Auto Var equipments for quick, economical pole top installation. All units are clearly marked to show Kvar rating. Get the full Sangamo Power Capacitor story. Ask your Sangamo Representative or write us today.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

MD-4 HYTOOL

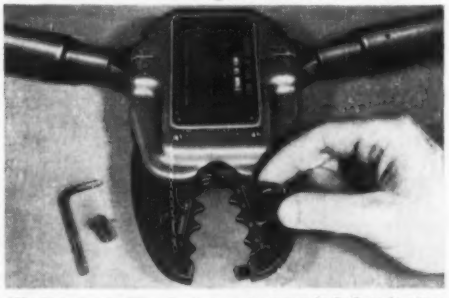
no.4 tap thru 2/0 splice

Now, you can install a wide range of distribution connectors on all conductors up to 2/0 . . . with just a single tool. The new MD-4, with interchangeable jaw inserts, will handle taps, splices, deadends for copper or aluminum through size 1/0 ACSR—or 2/0 for the Hysplices.

Tremendous force — 9,000 lbs. developed by combined cam and lever action—plus the simple change of die inserts—give the MD-4 a versatility never before achieved in a tool of such light weight and low cost.

Accessories include an insulating neoprene cover for the Hytool head, and a canvas carrying bag or steel case. Write Burndy for details.

Die inserts can be changed in less than a minute.



Aligning pins position the jaws—set screws, lock them in place.

BURNDY

56-9

Norwalk, Connect. • Toronto, Canada • Other Factories: New York, Calif., Toronto • Export: Philips Export Corp.

(*Continued from page 56*)

bered approximately 2,101,000 in 1955 and 1,909,000 in 1954. Pressure-treated crossarms of Douglas fir were almost 1,865,000 and 1,709,000 in '55 and '54, respectively. Of the varieties of crossarms that were non pressure-treated, Douglas fir was the leader with approximately 919,000 in 1955 and 609,000 in 1954.

Detailed figures and information are in the Wood Preservation Statistics published in the 1956 volume of the AWPA Proceedings.

Dual Fixture Provides Illumination and Air Conditioning

A dual purpose fixture that diffuses conditioned air and provides illumination, has been announced jointly by Pyle-National Co and Benjamin Electric Mfg Co. Called a Multi-Vent Trofferlite, it reportedly saves time and money, and reduces the number and variety of fixtures needed. It is also said to be adaptable to any drop-type ceiling, and to make possible more attractive interior design.

A booklet describing the new fixture is available from Pyle-National Co, Chicago 51, Ill., or Benjamin Electric Mfg Co, Des Plaines, Ill.

NSC Publishes 1955 Accident Rates for Various Industries

National Safety Council's "Accident Rates—1955" has just come off the press. The booklet gives the 1955 accident rates for various industries based on reports of National Safety Council member companies. Data includes frequency rate, severity rate, rates for various degrees of disability, death, and average charge (average lost time) for both major and minor industries.

The booklet is prepared by the National Safety Council's Statistics Division, 425 N. Michigan Ave, Chicago 11, Ill.

Resistance Welding Business Reported Increasing for 1956

Resistance Welder Manufacturers' Association, in a monthly statistics report to its members, said that business for 1956 had increased during July. Shipments for the first seven months of 1956 show a 61% gain over the same period a year ago. $5½ million worth of resistance welding machinery was shipped to customers during July, $1 million more than in June. Figures compiled at the end of July closely approach those for the entire year of 1955.

M&M BRIEFS

Westinghouse Electric Corp has reported these items:

- Expansion of its atomic power activities at the Naval Reactor Test Facility at Idaho Falls, Idaho, to make way for the erection of a new large ship reactor prototype.
- Development of a lightweight plastic and metal refrigerator which, it is said, can be customized to fit the needs and styling of any kitchen. The new box is of "sandwich" construction, the exterior layer is made of almost any lightweight metal or plastic, the center of polystyrene foam insulation, and the inside layer is of polystyrene sheet or aluminum.
- Assignment of UNIVAC—the electronic data processing system—to computation of the East Pittsburg plant's payroll and inventory control.
- Pay rises for approximately 120,000 employees resulting from the recent increase in the cost-of-living index.
- Increased sales of portable appliances, attributed to stepped-up merchandising activities and partially to the company's abandonment of fair trade.
- Expansion of the Air Arm Division, Baltimore, Md., necessitated by increases in personnel and volume of operations.

Schenectady Varnish Co of Schenectady, N. Y., has announced a 30% price reduction on its Isomelt polyurethane enamel effective Sept. 1, 1956. All orders received after that date will be priced at the new levels.

Line Material Co, Milwaukee, Wis., will build another plant at Visalia, Calif. Construction is expected to start about Nov. 1, 1956, with completion slated for May 1, 1957.

Republic Steel Corp has plans for a $4.5 million electrolytic zinc plating line at its Cleveland plant. The line will have an initial capacity of 10,000 tons, which may be expanded to 12,000 tons, if desired.

Joseph T. Ryerson & Son, Inc will sell Reynolds aluminum in the area served by its New York plant, starting this month.

General Motors Corp, 1775 Broadway, New York 19, N. Y., at a Society of Automotive Engineers' conference, said that it was confident that its newly developed GM-14 free piston engine would be a future contender in the commercial power field.

BUSINESS OUTLOOK

Electrical World
SEPTEMBER 24, 1956

Business still holds a rosy outlook about its future—and this optimism itself is going to be a big help. Last week's report by the Securities and Exchange Commission and the Department of Commerce, based on a July and August survey, shows business expects to purchase new plant and equipment at an annual, seasonally adjusted rate of over $36 billion this quarter and over $38 billion the next. If business comes anywhere near carrying out these expectations, it will clinch 1956 as a record year for capital outlays—23% above the record total of last year.

Here are some sample outlay figures (in seasonally adjusted annual rates) from this latest survey: Manufacturing as a whole lists $15.8 billion for this third quarter and $16.9 billion for the fourth while **public utilities expect to spend $5.2 billion and $5.3 in the same quarters.**

• • •

Compared with earlier SEC-Commerce surveys there's not much change in any sector except in mining, which now plans to spend for the whole of 1956 much more than it thought it would last spring. And planned outlays in the auto and steel industries are somewhat lower than originally set out but still well above last year's figures. (Similar surveys are made each quarter by SEC and Commerce. The McGraw-Hill Department of Economics makes one each spring with somewhat different definitions and coverage.)

• • •

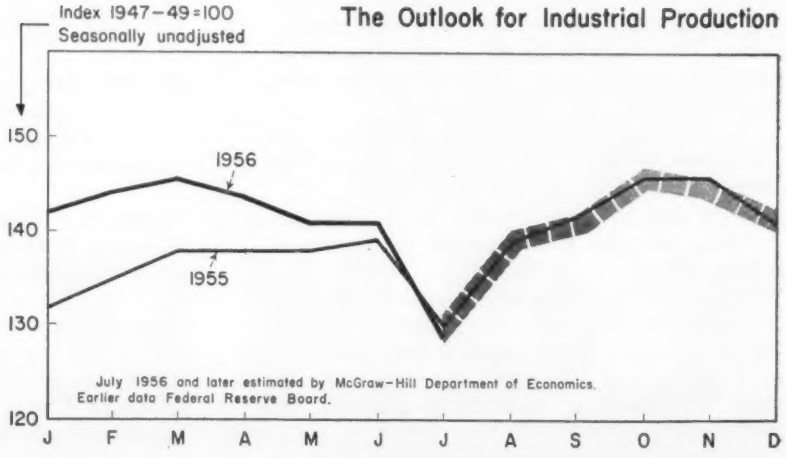
Caution, of course, must be given on two scores: a scarcity of materials, and a scarcity of money.

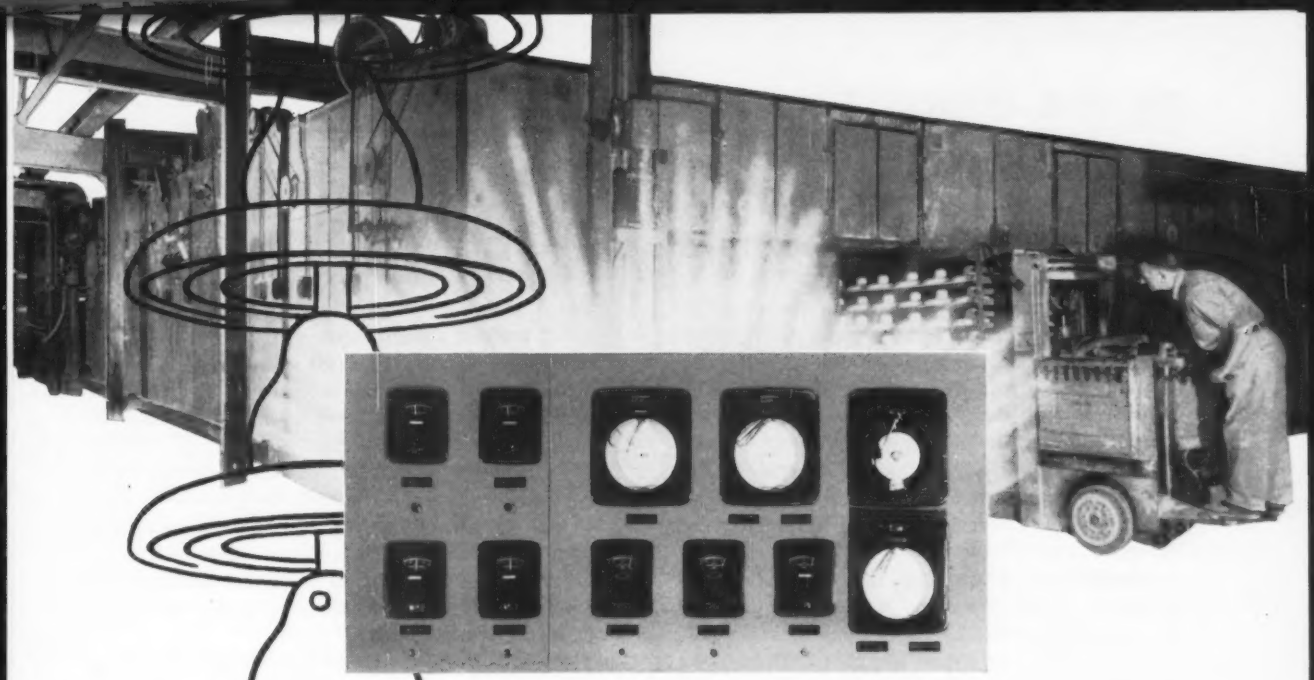
Business may be too optimistic about getting all the steel it wants. There is a good possibility that due allowance was not made for this factor. **Likewise, there may not be enough money to go around.** However, most of the really big plans have been too well laid out, with plenty of advance financial planning, to expect any big cancellations. At most, some marginal projects may be postponed until next year.

• • •

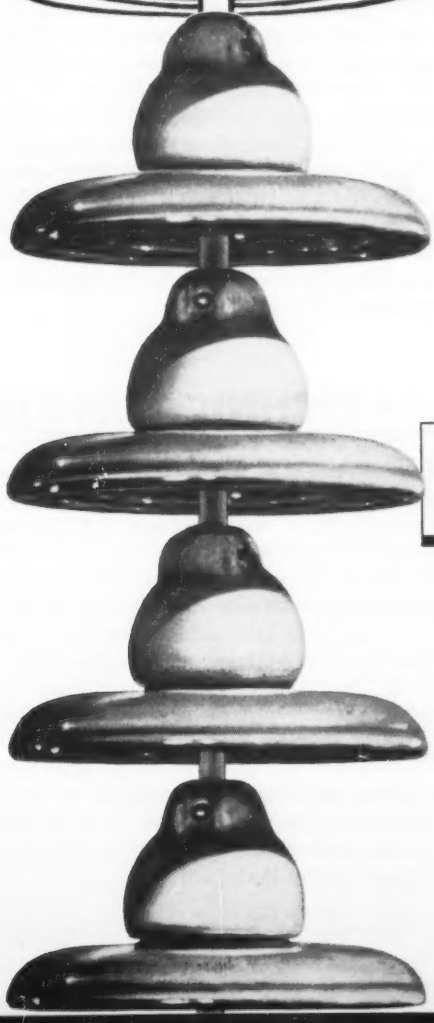
This latest survey reconfirms 1956 as having all the makings of a banner year. And the small amount of planned capital spending that may be postponed now and in the next quarter will be ready to start off 1957 with a boom—**a bright outlook for capital spending usually means a bright outlook for business generally.**

The Outlook for Industrial Production





1¼ POUNDS OF WATER is removed from every Lapp suspension insulator disc between its forming and its firing. A tunnel drier 100 feet long, 10 feet high by 17 feet wide, can handle 6,804 suspension porcelains at a time. Its controls, pictured here, maintain a strict time-temperature-humidity cycle. Porcelains that go from this drier to the kiln are dried evenly through-and-through, without stresses, strains or cracks. And they are *uniform* porcelain-to-porcelain. Because of such controls at each step of manufacture, we can promise that *every* Lapp unit will give a high margin of operating security on your lines.



Lapp

LOW-COST TRANSMISSION INSULATION is assured by high performance and uniform long life of every Lapp suspension unit. In terms of mechanical strength and electrical permanence, these discs represent an outstanding value at their initial cost. Product of automation and control in manufacture, their characteristics are *uniform*. The saving grows and grows, through years and years of trouble-free service.

Lapp Insulator Co., Inc., Le Roy, N. Y.

IN THE INDUSTRY

A Lesson for Engineers? . . .

Public Sees Scientists As "Odd Lot"

Most popular of all American inventor-engineers was Thomas A. Edison. The significant contributions of this genius cannot be disputed. But his fame with the public rests not so much on his greatness as on his natural aptitude for public relations. Edison was never too busy to talk to the press and never too busy to explain to a reporter his latest inventions. The press and the reporters repaid him by making his name a household word throughout the country and the world.

Edison's renown contrasts sharply with the obscurity of Nikola Tesla, the scientist-engineer who revolutionized power engineering with his alternating current transmission system and his induction motor (EW. Sept. 17, p 131). The public generally had little appreciation of Tesla during his lifetime. Nor have his contributions been fully credited since his death only 13 years ago.

Tesla Considered Typical Scientist

Unfortunately a large segment of the public seem to consider men like Tesla as representative of all scientists. And as the public generally is likely to closely associate engineers with scientists, the engineer is sometimes viewed in the same light.

Too often the scientists and the engineers deliberately shun publicity. Many willingly share their knowledge in technical papers and in talks to professional societies but find little time to explain them to the public generally. The result is that these professional men are looked upon as an "odd breed" by many people who have little knowledge of their actual work or contributions.

This impression is reflected by a survey of 15,000 high school students made recently by the division of educational reference of Purdue University. Here are some of the views of students:

- Thirty-five percent believe that it is necessary to be a genius to be a good scientist.
- Thirty percent believe that one cannot raise a normal family and be a scientist at the same time.
- Twenty-seven per cent think that scientists are willing to sacrifice the welfare of others to further their own interests.
- Twenty-five per cent think scientists as a group are more than a little bit "odd."
- Fourteen per cent think there is something "evil" about scientists.
- Nine per cent believe that you cannot be a scientist and be honest.

As the percentages show, these are beliefs of the minority. But small as these percentages are, they are too big for the welfare of a country which must depend on scientists to advance its progress.

Perhaps the cloak of secrecy must be wrapped about some of the work scientists are doing, say in the field of weapons development. But the scientists themselves must be publicized at least to the point where the public will recognize them as brothers in the human race.

The results of this survey may well contain a lesson that engineers will want to study.

TECHNICAL NOTES

Symmetrical sine-wave current must be used in testing tripping devices to determine accurately their tripping currents and time delays in alternating current service.

Steel bayonets above substation structures provide lightning protection when properly located without the hazard of breaking shield wires.

Lightning arresters rated 80% of system voltage can be used safely anywhere on a system which is solidly grounded at several points, including the remote ends of long lines.

Grounded station service systems provide better relaying and added safety to personnel.

Load shedding guards utility systems against loss of generating station auxiliaries from low frequency when trouble on an extensive transmission network drops major power sources.

Outdoor power plants gain added savings in the opportunity they offer to place equipment directly on its foundations without intermediate handling.

Capacitors grade voltage for restrikes as for normal power frequency in multi-break circuit breakers.

Sleet melting requires special attention to the current rating of disconnect switches, circuit breakers, wave traps, and current transformers to carry current in excess of normal load.

What's Behind SEC's Study?

Investigation of capitalization ratios could be slightly tinged with politics. Commission may be seeking "ideal" capital structure for utilities

Another presidential election year rolls around and Securities and Exchange Commission launches another study of utility holding companies. In 1952 it was a study seeking economies through the possible integration of utility systems under section 30 of the Holding Company Act. That elaborately planned study, you may remember, fizzled out soon after the election votes were counted and it became clear that a new Administration was to take over.

This year it is a study of capitalization ratios of holding companies and their operating companies. Just what the Commission may hope to accomplish has not been made entirely clear.

Perhaps one objective is to impress the public that SEC is on its toes performing its "watch dog" duties. The gradual decline of the Commission's work load has taken that agency out of the public spotlight during the off-election years. Announcement of a holding company capitalization study helps SEC to regain some public notice.

The Commission mailed out its first questionnaires in connection with the study Sept. 5. In a press release accompanying this action, the SEC wrote:

"The Commission is keenly aware of the direct effect of the over-all cost of raising capital on the rates charged consumers of utility service, on the rate of return allowed to the utility company, and on the ultimate return to investors. Any lack of economies in the raising of capital inevitably affects adversely both consumers and the general public; and, in the long run, investors also suffer."

This certainly raises the question as to whether SEC is seriously thinking of promoting an "ideal" capitalization ratio. If so, would companies which deviate from it be penalized both as to new financing and rate-making?

In spite of the current high cost of money, the SEC may be thinking of higher debt ratios.

On the other hand, the questionnaire seems to point rather sharply at the generating companies with their high debt ratio. Any lowering of these ratios might materially increase the cost of power and in turn impair their competitive position particularly against federal projects.

The press release accompanying the questionnaire goes on to say, ". . . it is of the utmost importance that public utility holding companies and their operating subsidiaries subject to the Act raise their new capital requirements in a manner designed to achieve the greatest economies possible."

Supposedly this has been within the providence of SEC in the past. The press release makes one wonder whether the Commission has been doing its full job as it now interprets it.

Louisville G&E Considers Stock Split

Shareholders of Louisville Gas & Electric Co will vote on a proposal to split outstanding common stock on a two shares for one basis. The plan already has the approval of the company's board of directors.

The common stock is currently quoted on the New York exchange at $63.50. The board felt that a split would encourage a wider distribution of stock and more activity on the shares. The Louisville G&E securities are said to be held largely by Louisville investors.

T. B. Wilson, president of the company, who announced the stock split proposal, believes it would aid the company by enabling it to have more shareholder-friends in the community it serves. No date has been set for stockholder's meeting.

FINANCIAL BRIEFS

Virginia electric utilities will pay $4.8 million of the $16.6 million assessed against public service corporations for state taxes. Railroads had the heaviest assessment. Total was $1.6 million above last year.

Pennsylvania Public Utility Commission has approved sale of Pennsylvania P&L's Scranton heating property for $250,000.

Idaho Public Utilities Commission will protest licensing of gas cooperatives to distribute natural gas in the state. A PUC spokesman says members feel an integrated distribution system provided by one company is superior economically. Also the PUC is not able to impose safety regulations on co-ops under present state law.

Future Financing

September Financing Heavy

Industrial financing was particularly heavy in September. Postponed in June and August because of marketing conditions, CIT Financial Corp rescheduled and sold $75 million debentures. Cost over June ½ a percentage point.

Switching to Common

Southern California Edison and Carolina P&L are selling common stock instead of bonds.

Utilities Schedule $185 Million for October

Most utilities are going ahead with financing plans. Electric and gas companies have scheduled $185 million for October.

Due Diligence Meetings

Sept. 28, Columbia Gas System; Oct. 17, Central Illinois Public Service Co; Oct. 26, Ohio Power Co; and Nov. 8, Public Service Electric & Gas Co.

(Furnished by the Irving Trust Co from the Financing Calendar)

DATE	COMPANY	Amount of Offering (Millions) DEBT	EQUITY
SEPT.			
25	Peabody Coal Co	35.0-N	.....
25	Virginia Electric & Power	20.0-C	
25	Long Island Lighting	.....	18.0-N-cv-rt Pfd
26	Southern Union Gas	.....	3.0 rt COM
SEPT.			
No Date	Jacksonville Expressway Authority	70.0	.....
	City of Memphis—Power Plant	135.0-N	.....
	Federal Land Banks	200.0-C	.....
OCT.			
1	American Telephone & Telegraph	.....	575.0rt COM
2	Transcontinental Gas Pipeline	.....	7.0-N-rt COM
3	Columbia Gas System	25.0-C	.....
3	California—Veterans	35.0-C	.....
8	Southern Bell Telephone & Telegraph	60.0-C	.....
8	Port of Portland, Ore	147.0-C	.....
9	California Electric Power	8.0-C	.....
16	Public Service of Indiana	30.0-C	.....
16	Carolina Power & Light	.....	13.0-N COM
17	Mass. Highway	58.0-C	.....
23	Consolidated Edison	40.0-C	.....
23	Central Illinois Public Service	.....	5.7-C
30	Ohio Power	28.0-C	6.0-C Pfd
OCT.			
No Date	Alabama Gas	7.0-P	.....
	Florida State Turnpike Auth	185.0-N	
	Texas Eastern Transmission	.....	15.0-N Pfd
	Johns-Manville	.....	36.0-N-rt COM
	Philadelphia, Pa	50.0-C	.....
NOV.			
14	Public Service Electric & Gas	50.0-C	.....
NOV.			
No Date	Transcontinental Gas Pipe Line	20.0-P	.....
	New England Power	10.0-C	.....
	Sinclair Oil	165.0-N-cv-rt	.....
DEC.			
3	U. S. Governments	9,100.0- -R	.....
4	Michigan Bell Telephone	30.0-C	.....
DEC.			
No Date	Appalachian Electric Power	24.0-C	.....
	Essex County Electric	20.0-C	.....
	Delaware Power & Light	.....	6/8.0-C pfd
	Public Service Electric & Gas	.....	35.0
	Texas Eastern Transmission	40.0-N	.....
	Metropolitan Edison	10.0-C	.....
4th Quarter of 1956 (Month not indicated)			
	Otter Tail Power	5.0-N	.....
	Northern Natural Gas	20.0-N	.....
	Philadelphia Electric	30.0-C	.....
	Columbus & Southern Ohio Electric	.....	Some Pfd
	U. S. Governments	3,000.0*	.....
	Central Vermont Public Service	1.8-N	0.7-N COM
	American Louisiana Pipeline	.....	15.0-C Pfd
	Texas Gas Transmission	28.0	.....
	Portland General Electric	16.0-P	.....
	Kansas Nebraska Natural Gas	5.5-P	.....
	U. S. Rubber	50/60.0- -cv-rt	.....
	Dade County, Florida	34.5-C	.....
	City of Dallas	40.7	.....
	Arizona Public Service	8.0-P	.....
	North Carolina State School	25.0	.....
	El Paso Natural Gas	30.0-P	.....
	Massachusetts Port Authority	115.0-C-R	.....
	J. P. Stevens	30.0-N	.....
	Southern Nevada Power	7.0-C	.....
	National Bank of Detroit	.....	14.0rt COM
	New York State Thruway	50.0-C	.....
	Public Housing Authority	125.0-C	.....
	Ohio Thoroughfare Revenue	75.0-C	.....
	Garden State Thruway	25.0-C	.....
	Sacramento Utility District	85.0	.....
	Grand River Dam Auth., Okla	27.0	.....
	Kansas City, Missouri	25.0	.....
	Hetch Hetchy, Calif	54.0	.....
	Connecticut Expressway	100.0-C	.....

Symbols: C—Competitive, N—Negotiated, P—Private, R—Refunding, cv—convertible, rt—Rights, Pfd—Preferred, COM—Common. (a) does not include amount to be offered to parent company. *Estimated.

Keeping track of

$5Al_2O_3.2MgO.24SiO_2.6H_2O.Na_2O.CaO$

...in Insulator Raw Materials

The complex formula above stands for "Montmorillonite", one of a group of highly plastic minerals present in the clay which is a component of every insulator. As these little known minerals contribute properties to the clay which are most important when it is formed into insulators for your power system, it is necessary to determine their presence and quantity in raw materials coming to us from the mines.

In the past, it has been difficult to make fast, positive identification of these fine clay fractions . . . even by such means as the petrographic microscope and X-ray diffraction.

Today, however, General Electric is pioneering the application of Differential Thermal Analysis (DTA) in this small but important phase of Locke* insulator manufacture. DTA is a reliable system for determining minerals in ceramic materials by interpreting differences in heat absorption and emission during firing between a test sample and a known inert material. These are recorded by the graph you can see in the photo. With DTA, another scientific method is added to mass production of fine electrical porcelain.

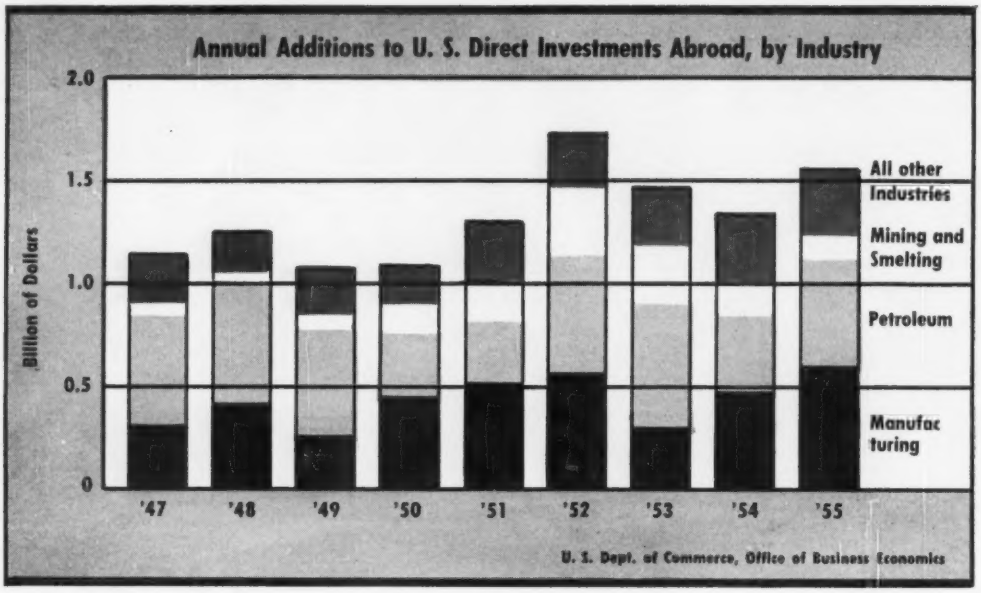
DTA is another illustration of the extremes to which we go to make sure you get Locke insulators of uniform density, high mechanical strength, dimensional accuracy and long service life. Insulator Department, General Electric Company, Baltimore, Maryland.

*Registered Trademark of General Electric Company.

Progress Is Our Most Important Product

GENERAL ELECTRIC

STATISTICS



Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity (million kw)	May	117.43	116.78	106.32	10.4
Peak—Class 1 Systems (million kw)	June	97.0	92.6	86.6	12.0
Estimated Dec. '56 Peak (million kw)	June	106.06	106.00	103.46	2.5
Production—billion kwhr	May	49.09	47.49	43.35	13.2
Hydro		11.70	11.55	9.81	19.3
Fuel		37.39	35.94	33.54	11.5
Sales—billion kwhr	June	44.53	44.18	40.10	11.0
Residential		10.98	11.02	9.62	14.1
Commercial		7.28	6.74	6.51	11.8
Industrial		23.80	24.04	21.62	10.1
Other		2.48	2.38	2.36	5.1
Fuel Consumption	June				
Coal—million tons		12.34	12.05	11.07	11.5
Oil—million barrels		4.61	4.47	4.69	− 1.7
Gas—billion cu. ft		127.04	110.51	107.42	18.3
Net Income Class A & B Co's—$ million	June	102.20	103.15	92.00	11.1
Residential Customers—millions	12 mos	44.99	44.87	43.76	2.8
Revenue per kwhr	ended	2.62¢	2.62¢	2.67¢	− 1.9
Avg kwhr per customer	June 30	2,879	2,858	2,649	8.7
Avg annual bill		$75.43	$74.88	$70.73	6.6

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	July	129	141	130	− 0.8
ENR Construction Cost	Sept.	147.8	146.0	141.0	4.8
BLS Cost-of-living	July	117.0	116.2	114.7	2.0
NEMA Sales					
Insulation materials	June	156	158	158	− 1.3
Electric appliances		106	103	118	−10.2
Wholesale prices	May				
Motors and generators		132.1	130.4	120.8	9.4
Transformers and regulators		137.5	135.3	127.3	8.0
Switchgear and fuses		151.2	149.0	135.6	11.5
GNP—annual rate—$ billion	2nd Qtr.	408.3	403.4	387.4	5.4

WHEN SPACE IS PARAMOUNT

New Switch Design For Moloney Network Transformers Saves Installation Space

You gain 5 inches of valuable vault space because Moloney's new high voltage switch is now 5 inches narrower than formerly. This results in an overall reduction in the length of network transformers, and permits more work space in old vaults . . . or reduces excavation costs on new vaults.

Moloney's new switch has the same liberal current carrying capacity as formerly. Electrical clearances have not been altered. In every way, Moloney's new switch meets NEMA standards fully . . . PLUS Moloney's own high standards of performance dependability.

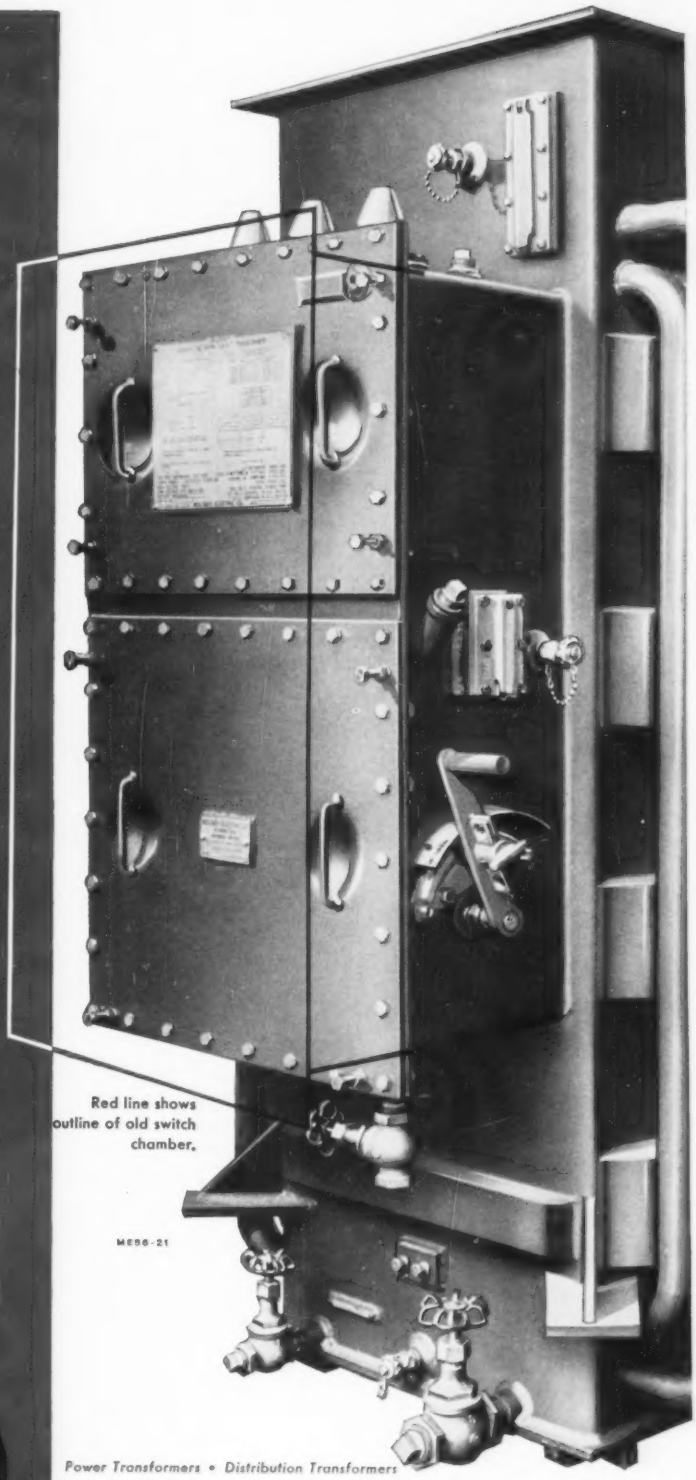
Save time. Save money. SAVE SPACE. Specify Moloney Network Transformers. They're engineered to provide dependable, continuous service for your network system.

MOLONEY ELECTRIC COMPANY

All Moloney Network Transformers feature positive, fool-proof, high voltage switches that conform to NEMA standards.

MOLONEY ELECTRIC

SALES OFFICES IN ALL PRINCIPAL CITIES



Red line shows outline of old switch chamber.

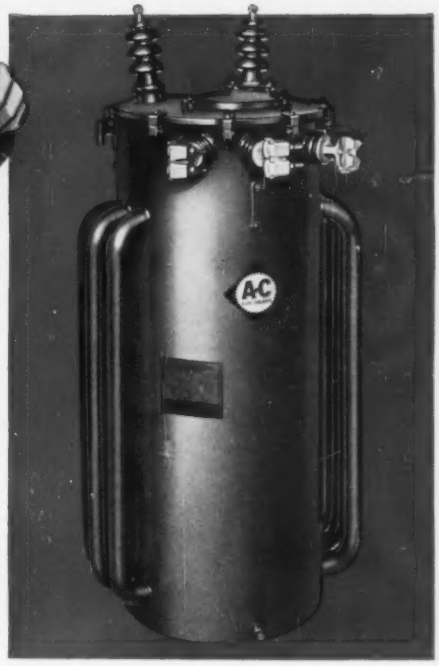
ME56-21

Power Transformers • Distribution Transformers
Load Tap Changing Transformers • Regulating Transformers • Step Voltage Regulators
Primary Unit Substations • Secondary Unit Substation Transformers • Network Transformers • Series Street Lighting Transformers • Subway Transformers • Industrial Dry Type Transformers • Capacitors • Transformers and Inductors for Electronics

FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CAN.

Quality Control at Allis-Chalmers

"Measuring" paint for long transformer surface protection



LIVE BETTER ELECTRICALLY

● Magnetic gauging of paint coverage is part of Allis-Chalmers way of insuring a corrosion-resistant finish on each distribution transformer. Painted tanks are gauged at several points to make certain they have the specified paint thickness when finished.

Through the Allis-Chalmers hot-spray painting process, solids percentage is increased, reducing solvent wash action on corners, increasing actual paint thickness at critical areas.

For all the information on quality control at Allis-Chalmers . . . *and what it can mean to you, call the Allis-Chalmers office near you or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin, for Bulletin 61B8355.*

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

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